# HARDWARE

AMERICAN SCHOOL of CORRESPONDENCE
CHICAGO ILLINOIS

# HARDWARE

INSTRUCTION PAPER

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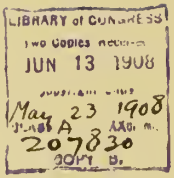
U.S.A.



# HARDWARE

**Introductory.** Hardware in building is generally considered to embrace all metallic appliances of a mechanical nature. For example nails, screws binding the various parts together, hinges permitting movement, and locks to secure moving parts in place, are all in the nature of mechanical appliances. Ornamental metallic parts, such as railings, grilles, steps, etc., cannot be classed under this head.

There is no other division of building materials in which the variety is so great or the range of each variety so wide. The distance, for example, separating the cast-iron lock (Fig. 1), at one dollar and a-quarter a dozen, from the cylinder front-door lock (Fig. 2), at seventy-five dollars a dozen, is great. If, however, we were to trace the evolution from the one to the other, we should find that the extremes are connected by such fine gradations and steps that nowhere can any break in type be detected: there is no missing link.

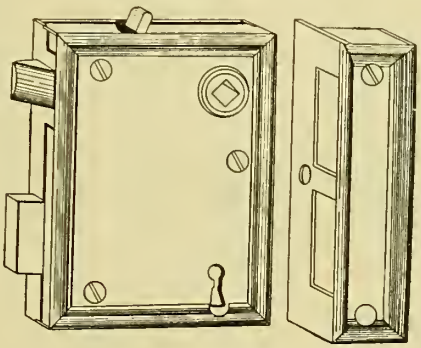


Fig. 1. Cheap Cast-Iron Lock.

The same conditions in varying extent apply to all other classes of hardware—hinges, bolts, etc.—and to a buyer who consults catalogues, comes the further complication that all items are sold, not according to the *price list*, but on *discounts* from such lists. The word *discounts* is here used advisedly, for there is no one, single discount applied to all classes of hardware. For different types of appliances, there are different discounts. Some items are sold as high as 10 per cent off; the next may carry a discount of 75 per cent;

and, between these, discounts are varied and graded as delicately as are the types themselves.

Time has had a marked effect in changing the character of hardware. The latches, knockers, or locks of 150 years back are very different from any of the types characteristic of to-day; and while the imitations which can now be made are good in their way, still nowhere in the 150 years is there a marked break in the line of development from the prized antique to the best production of the present day.

As a plain example, take the nails and bolts forged in the "factory" of Jefferson at Monticello, and nearly one hundred years ago used in the trusses over the old Senate Chamber at the Capitol in Washington (Fig. 3); compare them with those in use to-day, and then try to have duplicates forged; and the difficulty of getting the spirit of the past, even in simple things, will be appreciated.

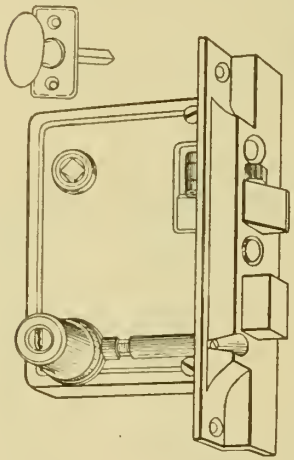


Fig. 2. Cylinder Front-Door Lock.

Nationality serves also to ring the changes. The French artisan will make a delicate but strong appliance which reflects unconsciously the influence of the objects of art with which he can and does daily come in contact. The Louvre, with its innumerable treasures of art—freely open to the street-sweeper in his blouse, as well as to the rich—has its effect on national production.

The English, from the same design, will produce something not so delicate, nor with such an artistic "go;" but it will be strong, heavy in fact, English.

The American will make the best reproduction of the design it is possible to get from his machinery in large lots; but it often lacks the fine touch of the artist, which the French impart, or the evident firmness of purpose of the English.

Also we find the personal element exerting a strong influence. As far back as can be traced in history, different men have considered

that they possessed certain qualities, or existed under certain conditions, peculiar to themselves, which in a way distinguished them from their fellows; and they have tried to illustrate such qualities by means of insignia borne by them and put in conspicuous places in their abodes. In this way the escutcheon has always been used as a distinguishing symbol.

Comparatively little attention is paid to heraldry nowadays, especially in America. The use of the symbol on the escutcheon is, in this country, a survival of old customs now rarely seen. The name of *escutcheon*, however, still clings to what is the most con-

Fig. 3. "Jefferson" Nails and Bolts.
From Trusses of Old Senate Chamber in Capitol, Washington, D. C.

spicuous piece of house hardware now in use; and this piece of hardware tells the story of the general character of the householder who selected it, just as truly as did the escutcheon of the wandering knight of mediæval years.

It will not be the province of this paper to settle the style or kind of hardware which should be selected by people of different temperaments, or to suit any design; individual tastes and judgment must in each case govern; but it will be its province, in a general way, to point out the characteristics of the material now obtainable, the intention being to offer something more in the nature of suggestion than as an absolute guide.

## NAILS AND SCREWS

These embrace the class of most uninteresting hardware—so commonplace as hardly to demand attention; but they play, after all, a large part in modern construction, and have had the greatest influence in the evolution of the now almost extinct trade of joinery, as understood a hundred years ago.

By reference to the cut of the "Jefferson" nail (Fig. 3), it will be seen that it is a wedge more adapted to splitting all wood through which it is driven than to make the parts more secure. It was the successor of the oak pin of Colonial days, and was used in much the same way. After the parts were most carefully fitted together, holes were bored only slightly smaller than the nail, and the latter was driven in to secure the close contact of the parts, which, indeed, were already fitted so nicely that they would cling together with a very slight binder.

Fig. 4. End of a Piece of Old Timber from Capitol, Washington, D. C., Showing Former Method of Making Spliced Joint.

Fig. 4 is the end of a timber taken from the Capitol, which shows how the splice joint was made; this was a *joiner's* fit, which took very little to complete the union. Through all the work of joinery—illustrated by this close fitting—the same principles extended, so that the use of nails of the Jefferson type was very limited.

Screws, except in very crude forms, were seldom used. Fig. 3 shows bolts and a nut of the same period taken from the Capitol trusses. It will be noted that in order to make their use possible, the parts must have been accurately fitted.

With modern machinery for making nails and screws, came a revolution in carpentry work. The old mortise-and-tenon timber frame gave way to the balloon frame. Joinery died a natural death, as it was found much cheaper simply to lay the pieces together and drive spikes or nails until the whole was solid. In many instances the use of spikes or nails was carried to extremes—in fact, their use became

reekless; and so important is their place in construetion work, even to-day, that it is a by-word, that "any man is a earpenter who can drive a nail." But the man who can select the right nail or serew, and drive it where it is needed, and in the right way, is a rare man.

From the strictly practieal standpoint, nails and serews may be divided into two classes—*First*, those used in eonstruetion work only; *second*, those used in construction work so exposed as to require consideration of the appearances they present.

For the first, round wire nails are now used almost exelusively. The older cut nail is wedge-shaped, with two rough sides, which make it hard to drive and which tear the fibre of the wood; the wedge shape, moreover, permits these nails, after they are once started, to be more easily drawn out. The wire nail is smooth, does not tear the wood, and is more easily driven than the wedge; and, on aceount of being of the same diameter throughout, it holds firmly even after being started in withdrawal.

A nail should never be driven clear through any woodwork so that the point appears, unless it is *clinched*, in which ease a wrought-iron or "clout" nail is required; the wire nail is too hard to be easily bent and elinched. A nail driven clear through so as to expose the point unclinched will not hold so well as one shorter with the end buried.

In the frame, it is not the number of nails that tells, but their careful placing in such parts and at such points as to keep the building stiff. Nails should be grouped to afford the largest effieieney. In nailing the boarding onto a frame, for example, it is neeessary to put two nails in each board to each stud. One nail would be suffieient to seeure the boards; but, as there is bound to be a slight shrinkage drawing the edges of the boards apart, if the frame is not otherwise securely braced, a strong wind will raek the strueture out of plumb until the edges of the boards touch again, the single nail in eaeh board allowing a swing which would have been effectually stopped by two.

The smallest nail competent to aeeomplish the purpose should be used, on account of the greater ease with whieh it can be driven; the difference in effort required to drive ten thousand 20d nails and an equal number of 16d's is a very material item in expense.

When strength is obtained by doubling timbers and in trusses,

bolts and nuts with large washers should be used to the exclusion of nails, as a sudden jar or a slight shrinkage of the wood will prevent the nails clamping the parts closely together, and this separation or loosening of the joints materially reduces stiffness and strength.

The use of wrought-iron nails can with great profit be extended. For instance, after a house is boarded up and building paper put on, in placing the exterior finish boarding, of whatever nature it may be, if the nails are clinched on the inside, the contact will be so close as to prevent the opening of cracks between the layers, and in cold weather the nails will not "draw" and allow the joints to open.

Where nails must be used in finished surfaces, all questions of general construction must be dropped, and only such nails used as are absolutely necessary to secure the members in place; and special attention should be given to selecting nails with such heads as will not disfigure the finish. Wire nails of very small diameter and with heads only slightly larger in size, are now made; and it is remarkable how firmly these hold the parts in place. These nails, carefully driven and with heads *set* below the surface of the finish, leave a small mark that can be readily hidden with putty colored to match the tone of the wood.

Fig. 5. Round-Head Screw with Washer.

Wherever possible, nails should be put in the quirks or concealed places, rather than in plain surfaces where the last blow of the hammer is apt to leave a round indentation in the wood. A careful carpenter in good work can place his finish so that it can be either nailed or screwed in place from the back, or the nails or screws placed so that the heads will be covered or in inconspicuous places.

In purely constructive work, screws (unless as bolts) are little used except in special finish, such as mantels and other cabinet-work put together and finished complete before being set in place.

When it is necessary to provide for the shrinking and swelling of the woodwork, round-head screws with washers can be used. Fig. 5 illustrates such a screw, *A* being the washer; *B* a long slot, and *C* the screw; this arrangement allows movement with the screw sliding on the washer.

When it is necessary to use screws in finished surfaces, the treatment should be exactly the reverse of that governing the use of nails.

There are many forms of screws on the market, with well-formed heads, finished in lacquer, blued, or plated (it is necessary to have *some* finish to prevent rust). A variety of typical forms are shown in Fig. 6. The custom of starting screws with a hammer—in

Fig. 6. Typical Forms of Screws.

fact, driving them three-quarters of the way in—should not be allowed; a screw with a battered head or not driven in straight, disfigures the work; when started by the hammer, one or both of these conditions generally prevail.

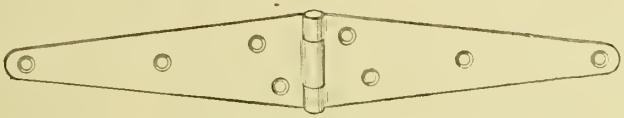


Fig. 7. Strap Hinge.

Screws which show should have heads of pronounced shape, spaced regularly—in fact, made a feature in the design.

## HINGES AND BUTTS

This group of hardware is the most important on the list, for

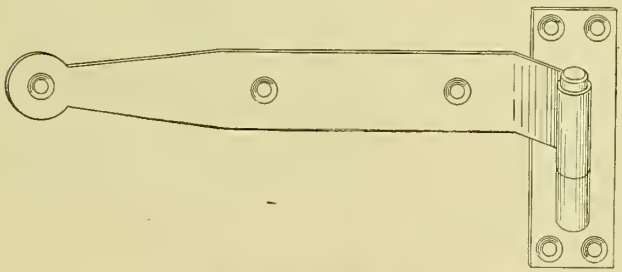


Fig. 8. Tee-Hinge with Offset.

if the hinge is out of order or lacking, the door is absolutely useless. It matters little if the latch, lock, or bolt be missing; some simple

device will supply the lock and produce the results usually obtained from the missing fixture. Without hinges, however, the door cannot be operated.

*Hinges,* properly speaking, consist in those appliances which are secured on the *faces* of the door and frame. Unfortunately they are now made, for the most part, in only the cheap grades, being used on barns and gates and in other inferior locations, and are known as *strap hinges* (Fig. 7) or *tee-hinges* (Fig. 8), etc.

The possibility of their artistic use is shown in the fact that manufacturers of high-grade hardware make a variety of *hinge plates* (Fig. 9) to be screwed on the face of door and frame independent of the butt, to represent the complete hinge.

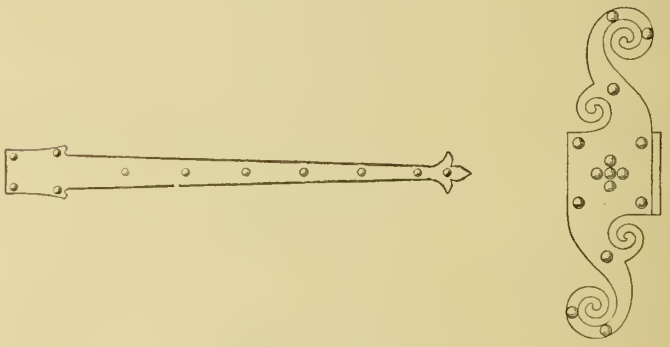


Fig. 9. Hinge Plates.

It is unfortunate that the hinge proper has dropped so completely out of the house hardware list. In its simple forms it has character and dignity. Some of the best efforts of the Gothic builders and the metal workers of the most artistic periods, have been put forth to produce hinges of perfect workmanship and design. The attempt of the manufacturers to supply the appearance by making the plates separate, has led to the production of unduly elaborated face-plates of thin metal, which are often screwed on without reference to their suitability to the location or surroundings, so that, instead of having the appearance of being a minor item for use in swinging the door, they give the impression that the door is for the special purpose of exhibiting the hardware.

The simple barn hinge may occasionally be used with propriety and good artistic effect. Fig. 10 shows a common form of the hinge on a house door where the finished timbers show throughout. These hinges are fastened by small lag-screws, and, while inexpensive, give a very artistic air to a common stock door. But there is difficulty when such appliances are used, in finding other fixtures to carry out the idea. In the case above referred to, it was necessary to have a latch forged specially (Fig. 11), as nothing suitable of stock pattern could be found.

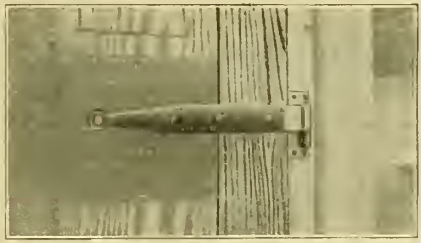


Fig. 10. Barn Hinge Used on House Door.

The *butt* (Fig. 12) is that style of hinge (butt hinge) commonly used in swinging doors, sashes, etc., which is screwed to the butt edge of the door and which can be fully seen only when the door is open; when shut, only the knuckles of the butt are visible.

Fig. 11. Forged Latch to Accompany Hinge of Fig. 10.

Modern custom requires, in the large majority of cases, that the conventional butt be used, and it should receive the careful consideration of the designer. There are many efforts to give ornamental effects, even in the cheapest of cast-iron butts, by working patterns on the parts never seen except when the door is wide open, and by making ornamental tips on the pin which fastens them together (Fig. 13). These attempts are unfortunate, generally serving merely to emphasize the cheap character of the article; and the plain black,

smooth surface is always to be preferred. With slight modifications, these objections may be raised against almost all attempts to make ornamental butts in other materials.

*Door Butts* (and this is, so far, the largest class) are made of cast iron, wrought iron, brass, or bronze, the expense increasing in that order. The cast-iron door butt should be avoided if possible, on account of its brittleness allowing it to break under slight stress, when the door, in falling, often does damage which costs more to repair than would a very expensive butt at the beginning.

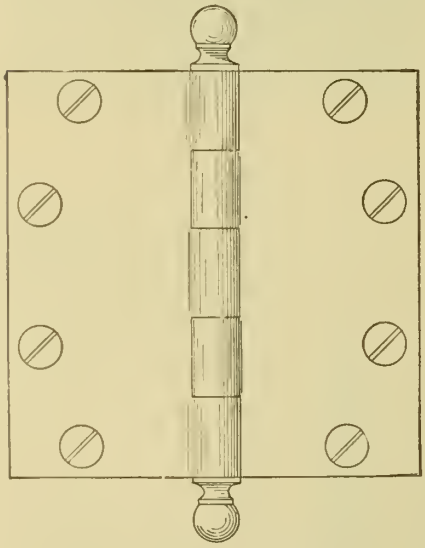


Fig. 12. Plain Butt Loose-Pin Type.

Fig. 14 shows the ordinary type of a *five-knuckled loose-pin wrought-steel butt.* The knuckles are marked *A*.

If the door is hung to the wing *E*, it is evident that the bearing points of the butt will be at *B*, *B;* if the door is hung on the wing marked *F*, the bearing points will be *C*, *C*. *D* is the head of the *loose pin*, which extends through the knuckles, as indicated by dotted lines; this can be withdrawn when it is desired to take down the door.

For ordinary doors the butt should not be less than four inches high, with five knuckles to each butt for the loose-pin type. An examination will show that there are always two bearings on each five-knuckled butt, so that if there are three butts to a door there are always six bearing points; and when the weight of the door is considered, with the fact that all this weight is carried from one side, the necessity for ample bearings will be appreciated. The loose pin allows the doors to be taken down readily; and when, from excessive use, the bearings have become worn, it also allows the placing of steel

washers (Fig. 15) between the knuckles, to take up the worn portions.

Wrought-steel butts can be had in plain material and fair workmanship, 4 by 4 inches, as low as $1.30 a dozen pairs, with screws; and from that up to $7.00 a dozen fitted with ball bearings and bronze-plated. The best grade of what is commonly known as the *Stanley* butt is a good example of this type. Butts are now often made with ball bearings (Fig. 16), which greatly improve the wearing qualities.

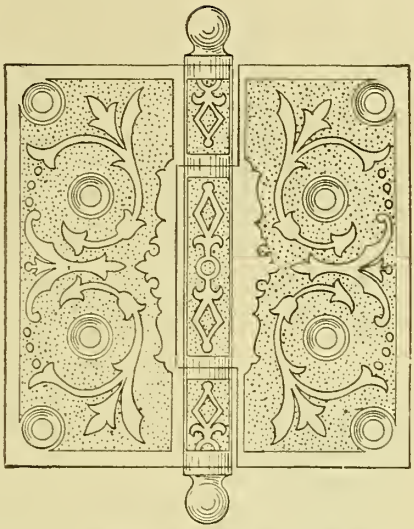


Fig. 13. Ornamental Cast-Iron Butt, Loose-Pin Type.

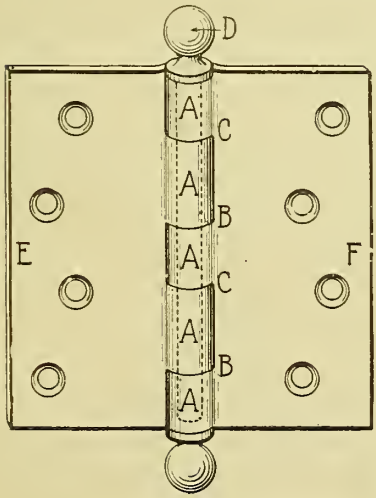



Fig. 14. Common Five-Knuckled Loose-Pin Butt.

Wrought-iron butts are also finished in various ways (especially in *Bower Barff*, to which finish reference is made later), and in fact can be combined with almost any line of hardware finish. They are to be recommended on account of their mechanical perfection.

Cast brass or bronze is used in expensive work, but to be efficient must be *very heavy*. The material is softer than iron; and if the bearing parts are not protected, they wear rapidly; a drop of one thirty-second of an inch in the

door on account of such wear, will at once cause inconvenience.

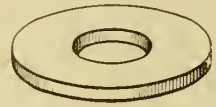


Fig. 15. Steel Washer for Butt.

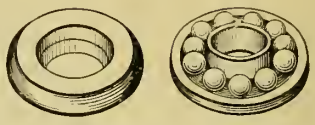


Fig. 16. Ball Bearings for Butt.

The protection against wearing of the knuckles may be by ball bearings, as above shown (Fig. 16), or, as in the more general practice, by *bushings* consisting of thin steel plates (as shown by the stippled part in Fig. 17) set in each face of each knuckle so that they receive all the wear and relieve the softer metal. In these plates are slight indentations (not stippled) which hold oil for an indefinite period. This oil lubricates the bearings. Often the knuckles are bored out, and a steel cylinder inserted as a bushing.

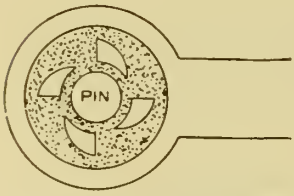



Fig. 17. Steel Plate Bushing Used between Butt Knuckles.

When it is advisable to use real bronze for butts, expense should not be spared to get the best from a mechanical standpoint. It is always a safe rule to get the cheaper material with perfect workmanship, rather than expensive material of indifferent workmanship.

There are many "ornamental" brass and bronze butts made by casting designs on the surface and emphasizing the effect by polishing the raised parts.

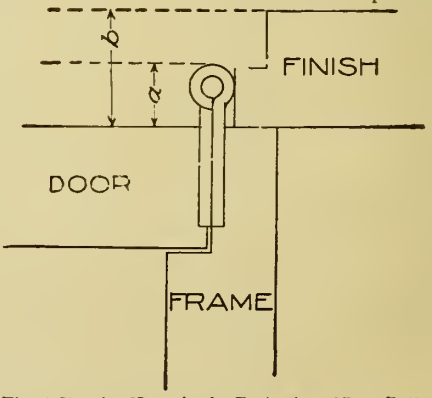



Fig. 18. Showing Necessity for Projection of Door Butt.

This does not add to the distinctness of the design, and only leaves the impression of a "well-broken" surface. *It will be noted that, in general, the plainer the butt, the higher the price, and the highest grades of butts are rarely of the ornamental variety.*

There is little ornamental value in the knuckles of a butt. A butt should, therefore, be of such a size as to project as little as possible beyond the door or frame. The only point to be carefully seen to, is that it shall extend outward far enough to throw the door clear of the trim or woodwork at the side. Thus the projection at *a*, Fig. 18, should be a trifle more than one-half the distance *b*, in order to carry the door, when opened back, clear of the side trim.

After the decision relative to the *style* of hinges or butts to be used is made, the closest attention should be given to the *mechanism*. A door in common use will wear its hinges with astonishing rapidity. Three hinges should always be used on a door. The third hinge, or the one at half the height, keeps the door from springing, and relieves the strain on the other two, so that the door is more easily operated; and it also gives 50 per cent additional wearing resistance.

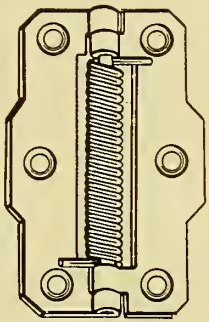


Fig. 19. Cheap Type of Spring Butt.

The same reason for using loose-pin butts as above given for doors, apply to the hanging of all items swinging on upright bearings—such as cupboard doors, window-sash, etc.; and it is sometimes necessary to use much care in the selection, in order that the swinging parts may turn clear of all obstructions or fold back on themselves, as with inside blinds.

Where the swing is from horizontal bearings, the pins should always be *fixed*—that is, so made that they cannot be removed. In an upright position gravity holds them in place; but when put horizontally, the swinging of the sash works the pin loose, and in time it is apt to fall out and allow the sash to drop, this being the case particularly in swinging transom sash.

Besides the types of butts above referred to, there are many

appliances properly classed under this head designed for special service, such as *spring butts* and *double-acting butts*.

**Spring Butts.** Spring butts are those in which a spring is placed so as to force the door closed when not held open by some other force. These vary from the light type commonly used on wire-screen doors, costing from 10 to 15 cents a pair (Fig. 19), to heavy bronze butts with a high-grade metal spring in the joint, costing $5.00 a pair (Fig. 20), which can be regulated to give either a strong or a light reaction.

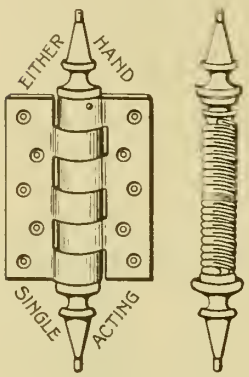


Fig. 20. Heavy Bronze Spring Butt.

The disadvantages of this type are that they rack the door by constant slamming; they are much more expensive than butts of the same material without the spring; and when once installed, it is practically impossible to throw the spring out of service. For the light and cheaper work, a single spiral spring (Fig. 21), costing from 15 to 25 cents, can be used independently of the butt; it is easily unhooked when not needed.

For the better grades of work and heavier doors, a spring check should be used (such as is described under *Miscellaneous Hardware*), which will close the door promptly and prevent slamming.

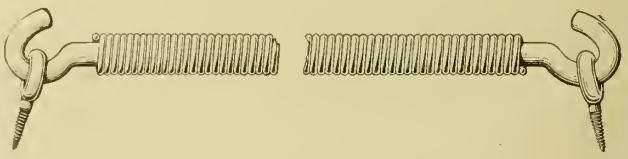


Fig. 21. Common Type of Spiral Spring for Doors.

**Double-Acting Butts.** The function of the double-acting butt is to allow the door to swing to both sides of the jamb. It is necessarily of the spring-butt type, above mentioned, but is double and is so set as to leave the door shut when at rest. There are no cheap types of this butt on the market, and the work required makes the best mechanism necessary. There are no appliances which can be sub-

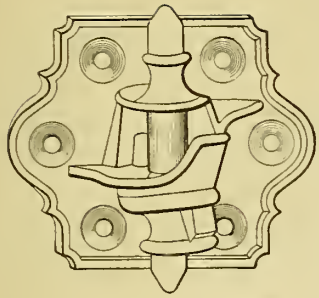


Fig. 22. Gravity-Blind Hinge.

In selecting double-acting butts, always get a large size capable of doing the work easily, as the jar on a light butt as the door passes the closed point will quickly rack a light appliance into a useless condition. In house building, the use of double-acting springs is usually confined to china-closet doors, and in public buildings to entrance doors. In a very large number of cases a little study will devise means of substituting simpler appliances. For a public building, for example, two single-acting doors can be used—one for entering and the other for outgoing traffic.

**Blind Hinges.** Outside *blind hinges* are important items, especially in rural districts in the North and stituted as in the case of simple single-spring hinges. In order to do the work satisfactorily, a very large hinge is required—too large to be ornamental—so that certain types are embedded in the floor, out of sight; these are peculiarly adapted to heavy doors when the floors are of Mosaic so that the hinge can be firmly bedded in concrete.

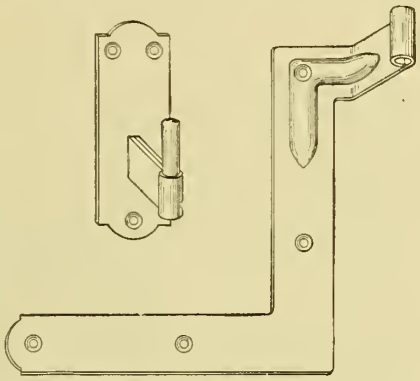


Fig. 23. Wrought-Iron Blind Hinge.

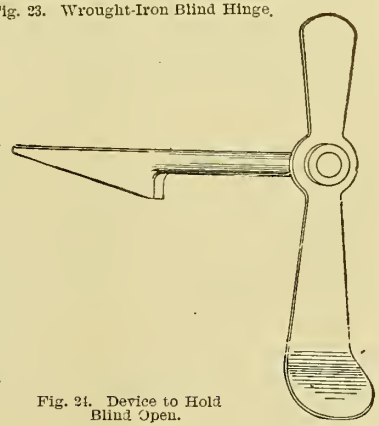


Fig. 24. Device to Hold Blind Open.

throughout the South, where blinds are a necessity. The usual cast-iron *gravity blind hinge* (Fig. 22) is a very cheap and unsatisfactory fixture. The smallest jar or blow will break hinges of this type. A heavy wind, catching the blind, will often slam it with sufficient force to break the window glass. It is much better to procure some type of wrought-iron hinge (Fig. 23), and a separate appliance to hold the blind open (Fig. 24). This type of hinge is also rather ornamental, the part fastened to the face of the blind being in the true sense of the term a hinge-plate.

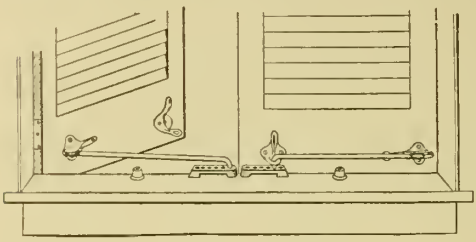


Fig. 25. Blind Adjuster.

A *blind adjuster* is indicated in Fig. 25. There are several appliances on the market which accomplish the same result — that is, holding the blinds secure at any angle up to about 60° from the sash plane. It is very desirable to install these fixtures — which are strong, and which hold the blind firmly — where blinds with fixed slats rather than rolling slats are used. If a substantial blind is desired, the fixed slats should always be used; the light passing blinds opened only two or three inches is very agreeable.

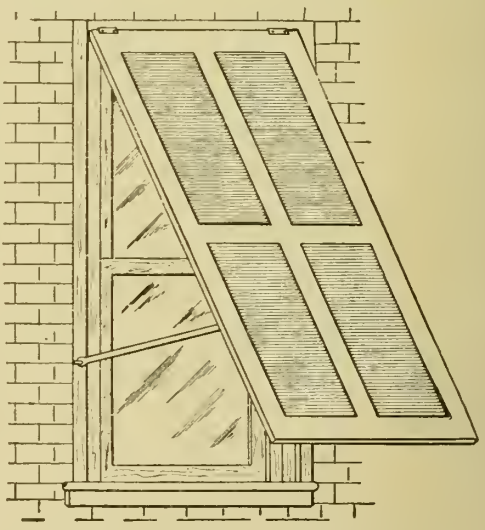


Fig. 26. Awning Blind Hinge in Use.

There is also on the market an *awning blind hinge*. This permits the blinds to swing in the usual way, and, in addition, to be clamped together; and with the tops against the house, the bottom can be set out from one to two feet like an awning (Fig. 26), giving a delightful soft light inside. But to accomplish all that is desired, it appears to be necessary to make these hinges delicate and light; and a little hard usage or a heavy wind will break them, so that the greatest care must always be exercised when operating these blinds, to leave them secure; and generally it may be said that such fixtures are unsuitable for wide or heavy blinds.

## LOCKS

As has been stated, the hinge is the most important item of hardware from the standpoint of necessity or convenience; but it is apparently the general sentiment of both sellers and buyers, that the lock is the central figure. The manufacturer puts more thought on it than on any other appliance; and in selecting hardware, the customer generally devotes most of his attention to it. Perhaps the reason for this discrimination is that the lock symbolizes protection and defense; the term *symbolize* is here used because, on an analysis, the lock is rather a symbol than a real physical protection.

With the advancement in the art of lock-making, the knowledge of methods of nullifying the safeguard afforded by locks has also advanced, so that there are no locks to-day which cannot with more or less ease be operated by unauthorized persons. When elaborate and intricate locks are used, it is often ridiculous to see on what flimsy doors they are placed, and also what delicate and flimsy locks are placed on ponderous doors.

A brief study of the conditions usually surrounding the placing of locks will show the absurdity of expending large sums of money and of buying intricate locks with an idea of obtaining protection thereby. Under ordinary conditions, the moral effect of the lock is enough to afford protection; but when the experienced cracksman or determined burglar seeks to obtain entrance, neither moral effects nor mechanical appliances are a bar.

The object of the foregoing is to set forth the province which a lock should be considered as filling—or rather to show the province it does not fill—so that in buying this most expensive of hardware,

funds needed elsewhere may not be expended in intricate mechanism of doubtful protective value.

Locks are either of the *rim* type or of the *mortise* type. The rim lock is fastened on the face of the door (Fig. 27). It should be used only when protection is desired from the outside, as, for instance, on store or office entrance doors, and possibly outside house-doors. Locks of this type are usually operated by means of a key from the outside and a thumb-piece from the inside; if of a type requiring a key for both sides, they are no protection on the side on which they are visible, as the removal of one screw will usually allow of sufficient change of position of the lock to release the bolt. Rim locks are not ornamental, are generally made of ordinary cast-iron, and their use should be avoided in the better grades of work.

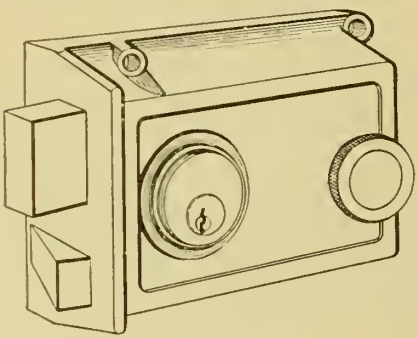


Fig. 27. Rim Lock.

The mortise lock is set into the face of the door, so that only the face-plate, with bolt and latch, shows on the edge when open (Fig. 28). Inasmuch as it is necessary to cut out the woodwork of the door to place a lock of this type, the first consideration in its selection should be one of size. The smallest and thinnest lock which will serve the purpose should be chosen.

As all the parts except the face-plate are hidden in the mortise, there is no use in ornamental work. The exposed face is usually plain brass or bronze; the case is generally cast iron or pressed steel, which should be heavy enough to hold its shape firmly, without springing or cracking if for any reason the mortise for which it is intended is not of the proper shape or size, which it rarely is.

After the question as to the use of a rim or a mortise lock is settled, another, covering just what is wanted of each lock, should be carefully considered, so that appliances will not be installed which are never to be used. Practically all locks contain a *latch*—that is,

the part which is operated by the knobs and which holds the door closed under ordinary conditions. As the latch is the part subject to most frequent use, it is very desirable that its mechanism be as simple as possible and that all moving parts be of brass or bronze. The use of iron, except in the casing, should be avoided.

It is often observed, in finished work, that the latch is not easily pushed back when the door is shut, making it necessary to turn the knob or to give more than an ordinary slam to latch the door. This is caused by badly fitting parts, poor springs, and the shape of the latch-face. If the latter is a simple line as illustrated in Fig. 29, it will probably cause constant annoyance. If, however, the latch-face is carefully shaped after the manner shown in Fig. 30, there will be less, if any, trouble.

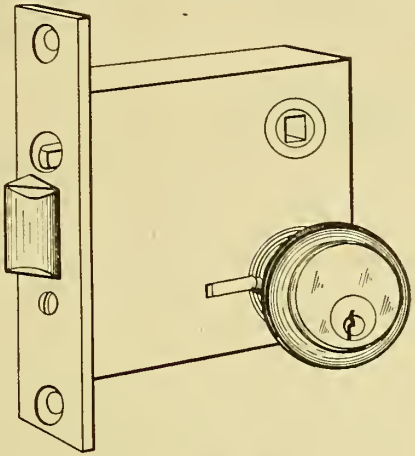


Fig. 28. Mortise Lock.

The latch should be heavy. It receives hard usage, and the heavier it is, the more evenly it responds to pressure. There are various *anti-friction* devices on the market, but they are rarely any improvement over the well-designed and well-manufactured latch-face. Should the selection, however, be unfortunate, and the operation of the latch unsatisfactory, conditions can be remedied to a certain extent by occasionally oiling the face of the strike with a heavy oil which will not readily disappear.

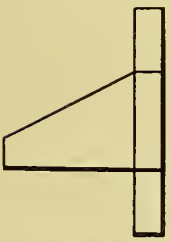


Fig. 29. Unsatisfactory Outline for Latch Face.

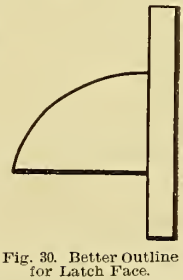


Fig. 30. Better Outline for Latch Face.

In a large majority of cases, this latch (Fig. 28) will perform all the necessary functions of the lock and latch for outside doors if it is arranged with *stopwork* on the face. By pushing in one button, it can be operated from the outside only by means of a key; by reversing the button, it becomes a latch operated by knobs from both sides. Under the former condition it is as secure a lock as is the *dead bolt* operated by a key independent of the latch—a device which, while often considered a necessity for outside doors, is rarely used.

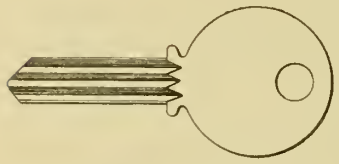


Fig. 31. Latch-Key of Flat-Key Type.

Inside doors rarely require a lock; and where they are not really needed, it is not wise to arrange for a possible future need, since in most cases, if such need arises, the keys will either have been lost or have become hopelessly mixed.

In selecting door locks, the first and most important consideration should be given to the latch lock. A type with the heaviest mechanism and best materials in the smallest case, should be selected; and that type, in one of its various forms, should be used throughout to the exclusion of all other forms, unless unusual conditions require other appliances—as, for example, where doors are to be locked from both sides, in which case the dead bolt is necessary, which can be operated only by key from either side. With this, as with all hardware, the simplest form is the best. Locks which have peculiar combinations, such as turning the key in a certain way to operate one bolt, and further in the same way or in an opposite direction to operate the second bolt, are to be avoided. They afford no additional protection, and are often confusing in the extreme to the owner. The distance between the center of the knob and the face of the lock should never be less than $2\frac{3}{4}$ inches, and it is better to be 3 inches. If less, the fingers of

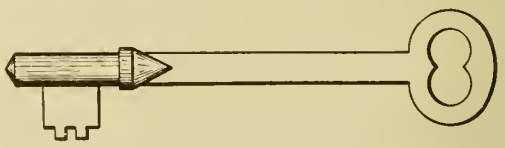


Fig. 32. Common Type of Bit Key.

the operator will be pinched between the knob and the door-frame.

The key is an important item, and selection of the style of key should always be with strict reference to the use of the lock. The *latch-key* will be in daily use and carried by several persons, and should be of the smallest *flat-key* type (Fig. 31), with a distinctively shaped hand end so that it can readily be distinguished at all times from desk or drawer keys on the same ring.

If a dead bolt is used, its key should be of the larger type of *bit key* (Fig. 32). This is inconvenient to carry away, is not easily lost, and can generally be found at the rare intervals when it is needed.

All keys should be strong, whether flat or bit. Delicate keys are often twisted off when the lock "sticks" a trifle, or—which happens more frequently—when they are not inserted quite far enough before an impatient wrench is given them. Once bent, they are useless. They should be well finished and nickel-plated. Otherwise they will rapidly wear the pocket, and become rusted; and a rusty key will rarely work satisfactorily.

It is often desired that locks be master-keyed—that is, so constructed that each lock will be operated by a key differing from any other, but also so made that one *master key* can open all, as in the case of office buildings, for janitors' use, and in hotels to accommodate the service. This requirement is always unfortunate, as it permits the passage of every lock in the series by one key. This is like very securely guarding several entrances to an enclosure and leaving one gate with but little protection; and it is much better to cause the janitor a little additional trouble by requiring him to carry a separate key for each lock. If the master key is lost, the only remedy is to change the entire line of locks.

There should be no identifying marks on keys or rings indicating the location of the locks they will operate, for, in case of loss, the finder would thus be enabled to use them.

In selecting locks for any particular building, a careful diagram or floor-plan should be prepared, on which the swing of all doors is indicated and each door numbered (see Fig. 33). A *right-hand* (R. H.) door is one which when opened away from a person has its butts on the right-hand jamb; and a *left-hand* (L. H.) door has its butts on the left-hand jamb. All latches are either R. H. or L. H.,

while many types are made so that by reversing some of the mechanism they can be changed from R. H. to L. H. It is better to get an unchangeable latch, which is less complicated in its mechanism and will work easier and last longer than one with interchangeable parts.

The doors on which it is intended to place locks with pass keys (Fig. 34)—such as front and back outside doors—should be indicated; as should also those doors it is desired to lock on the inside by key (as pantry or closet doors, Fig. 35), those it is desired to bolt (as bedroom doors, Fig. 36), those requiring simple latches without

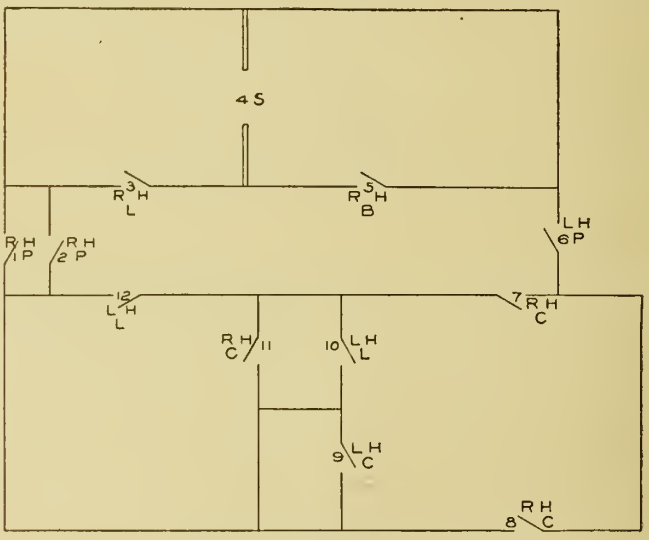



Fig. 33. Typical Floor-Plan Showing Location and Swing of Doors.

lock or bolt (as doors from hall to dining room, Fig. 37), and sliding doors, which require an entirely different type of lock (Fig. 38). A bill can be made somewhat on this line:

| | | | |
|---|---|---|---|
| 2 | Right-hand locks with pass keys, marked | R. H.-P | Nos. 1–2, |
| 1 | Left " " " " " " | L. H.-P | " 6, |
| 1 | Right " latch " | R. H.-L | " 3, |
| 2 | Left " latches " | L. H.-L | " 12, 10 |
| 1 | Sliding-door latch " | S | " 4, |
| 1 | Right hand " with thumb-bolt, " | R. H.-B | No. 5, |
| 3 | " " " " key " | R. H.-C | " 7, 11, 8, |
| 1 | Left " " " " " | L. H.-C | " 9, |
| 12 | Total locks and latches. | | |

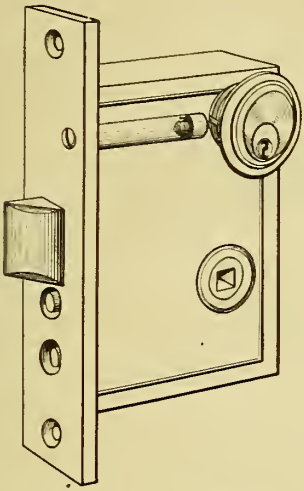


Fig. 34. Lock with Pass Key.

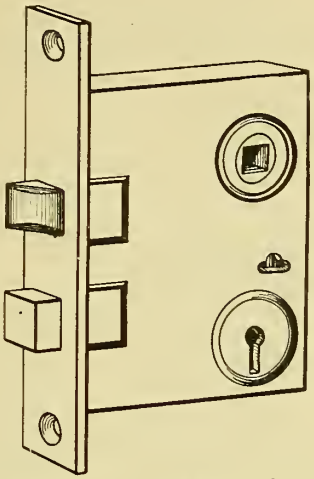


Fig. 35. Latch with Key-Bolt.

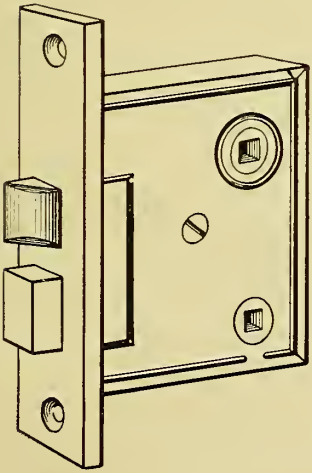


Fig. 36. Latch with Thumb-Bolt.

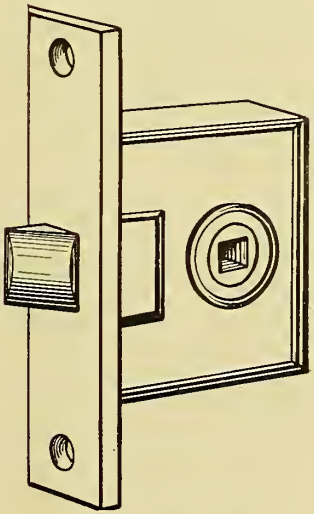


Fig. 37. Simple Latch.

Upon receiving the locks and latches, there should be attached to each a tag bearing the number of the door for which it is intended. If the fixtures are not numbered and it is left for the fitter to sort them out as he proceeds, there will be confusion before half the items are in place.

Aside from the door locks above referred to, there are almost numberless uses to which locks are placed in minor situations; but it is safe to say that not over 10 per cent of locks in such minor situations are ever used—as, for example, on the cupboard door, bureau drawers, etc., which, though always having locks, are rarely locked. It is always better to omit a lock where there is no actual necessity therefor, and when the necessity occurs, to get a lock of the best type. A lock operated by a flat key is usually safe for such places; those with the old bit key are rarely of any protective value.

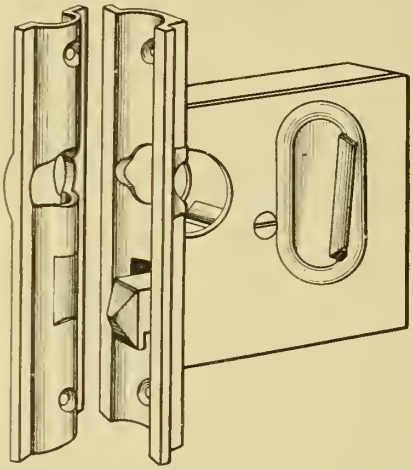


Fig. 38. Sliding-Door Latch.

## KNOBS AND ESCUTCHEONS

These are parts in which the vanity of the owner can be—and often is—displayed. The *escutcheon* is the plate through which the key-hole is cut. It is usually combined with that on which the knob is placed, and is the lineal descendant of the escutcheon of chivalry borne by knights and persons of distinction. Careful study of escutcheons on the doors of houses, will show that much of the character of the owner is still indicated thereby.

With this fact in mind in the selection of hardware, special attention should be given this feature. A plain brass or bronze plate and knob is usually a safe selection; but even then such items as its thickness or the way the edge is finished tell of conditions governing

its selection. When the design calls for something more elaborate, it is a mistake to be confined to simple, plain work; but under no circumstances should a knob and escutcheon of elaborate or ornamental character be selected simply on account of such character when the surroundings do not call for display.

The escutcheon, at the point where it receives the shank of the knob, should always, even in cheap work, be so enlarged that it will project over the shank of the knob at least a quarter of an inch and fit closely; this stays the knob and gives it a firmness when gripped not otherwise obtained. The escutcheon plate should also be long enough to extend both above and below the lock; if it does not do so, the screws that fasten it in place can rarely be long enough to hold it firmly, as the side of the lock is usually within $\frac{3}{4}$ or $\frac{1}{2}$ inch from the surface of the door. The screws securing an escutcheon should always extend one inch into the wood.

A great variety of materials are used for both knobs and escutcheons—wood, glass, iron, brass, bronze, and metal plated with silver or even gold—and designers have produced many very artistic as well as many very much over-elaborated forms, which are easily cast in metal—sometimes with unfortunate ease, as it permits the reproduction of designs cheaply and has therefore encouraged their use in many cases where it would have been better to omit a large part of the ornamentation. This cast ornament is an American feature of hardware, that produced in Germany, France, or England being more generally of the wrought type, artisans in those countries being skilled beyond the American in forged work.

The *knobs*, and the *spindle* that connects them—which together operate the latch—are primarily mechanical contrivances and should be considered as such. The old scheme of making a solid spindle which was secured to both knobs by screws through the shank of the knob running into the nearest hole in the spindle, the play being taken up with thin washers, was always bad, inasmuch as, when enough washers were put in to make the knob feel solid and to prevent its rattling, it was usually so tight as to bind. The screw always works loose, and being small is lost as soon as it drops out. Before a new screw is found, some of the washers very likely disappear; and if new ones are not obtained, the knob remains permanently loose.

Many devices have been provided to do away with these defects

in mechanism. In one of these devices, the spindle end is in three pieces, the middle one wedge-shaped. A screw through the shank bears on this wedge-shaped piece, thus expanding the two others

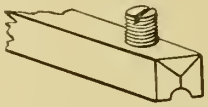


Fig. 38. End of Expanding Spindle.

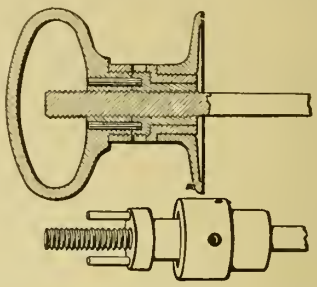


Fig. 40. Knob-Holding Device, Adjusted by a Thread.

against the sides of the slot in the shank (see Fig. 39). In practice it is found that this screw when set hard against the wedge does not work loose; before it is set, the knob can be most delicately adjusted without washers; and if the screw should work loose, notice would at once be given by the slipping of the knob before the screw was lost.

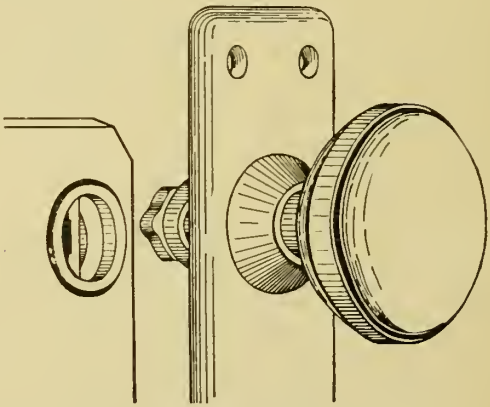


Fig. 41. Knob-Holding Device without Spindle.

Another but somewhat more expensive device is that illustrated in Fig. 40, in which the knob can be delicately adjusted by a thread so that an exact fit can be obtained.

There are other devices in which the spindle is entirely dispensed with, and the knobs are slipped into the lock-case independently of each other, as in Fig. 41.

Where locks with pass keys are used so that stopwork changes the latch into a lock, it is desirable that one side only should be affected. The spindles of such locks are, therefore, jointed in the lock with a swivel-connection which allows at all times a free movement of the inside knob or key (see Fig. 42).

Fig. 42. Spindle with Swivel-Connected Ends.

Door knobs should be from $6\frac{1}{2}$ to 7 inches in circumference, whether round or oval, to be gripped with ease; if larger, they should accompany locks which allow them to stand far enough out from the finish to prevent the hand from being pinched or bruised in turning the knob or opening the door. This distance, for ordinary knobs, is given under *Locks* as $2\frac{3}{4}$ to 3 inches, which distance should be increased if a larger knob than ordinary is used. A perfectly plain knob is rarely out of place, while any attempt at ornament is more than likely to appear so. For ordinary work, *spun brass* knobs wrought from thin sheet metal (Fig. 43) are very serviceable, and have the appearance of the genuine cast metal. With the plated butts, they make a good combination (though they will not stand blows without indentation), and for most purposes are as serviceable as the cast metal. In better work, however, the cast brass or bronze should preferably be used, in which the metal is cast from $\frac{1}{8}$ to $\frac{3}{16}$ inch thick; these are the strongest type used.

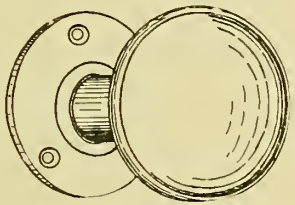


Fig. 43. Spun Brass Knob.

For the last few years there has been a tendency to adopt the types of Colonial days, and nowhere is this tendency seen more than in hardware. And with these designs have come some of the olden appliances, the most prominent of which are latches and knockers. The former are most useful, and, when applied in proper locations,

have a charm which knobs do not possess; but in the case of mortised fixtures of the type usually operated by knobs, they are frequently—in fact, generally—out of place.

Knockers as now used are only for ornament, being rarely used by callers for summoning the inmates of the house.

## SASH HARDWARE

In all the range of house hardware, there is none so unsatisfactory as that used in connection with window-sashes. This is not altogether the fault of the hardware, as the customs regulating the manufacture of the sashes themselves make them the most flimsy part of house construction. The glass is wide, and the meeting rails narrow. Sooner or later someone tries to force up the lower sash when "stuck," by pushing violently on its top rail, or tries to pull down the top sash by pulling on its bottom rail; these operations pull the rails away from the glass, and if, when "fitted," there was not considerable play, the sashes never come together again. Any sash-lock adapted to such a position must necessarily be far from exact in its working. All work perfectly in the model; few work at all on the real sash. Therefore, in selecting this fixture, it is wise to pick out the strongest which will allow for variation in the rails, and, before purchasing, to visit some house in which they have them installed, in order to see how they work. The material of which sash-locks are made makes little difference, as they are generally out of sight. Little attention need be paid to representations that certain kinds can be opened by means of a thin blade inserted between the sashes from the outside; for, after one has seen the difficulty of working them from the inside by the usual means, he will never be troubled by the thought of anyone working them from the outside with a putty-knife.

There are certain kinds which throw up the arm against the glass of the upper sash when unlocked. This kind should not be used, as they at once give notice to anyone outside, if the window has been left unlocked.

*Window pulls* or *handles* on the lower sash are always very difficult things to get a "purchase" on with the ends of one's fingers when the sash "sticks;" and while the socket in the top sash with a pole and hook to move it, is a trifle the most exasperating of any part

of window hardware, manufacturers have as yet failed to remedy the trouble.

There are on the market quite a large number of complicated devices for operating sashes, either swinging them into the room or sliding them up and down; but in practice the old trouble of flimsy sash construction makes such devices of no more value than those of the old form. It is doubtful whether any remedy will be found until custom requires the use of smaller glass, of sash bars to stiffen the sash, and of better carpentry work in fitting, and requires owners to keep all parts of sashes and frames thoroughly oiled to prevent the constant absorption of dampness, thus preventing swelling and shrinking with their concomitant effects of sticking and rattling.

When sashes are hung at the side—as is frequently the case—they should swing outward; if they swing inward it is difficult to keep out storm water. For holding them at any required angle, bars are

Fig. 44. Sash Fastener.

made with clamp screws (Fig. 44). These work very satisfactorily; but, unless great care is exercised to leave the sash always firmly clamped, sudden wind may wreck the sash and glass, leaving no protection from the storm. As a general thing, accordingly, it is better to retain the old sliding type of window, especially since, with swinging windows, the use of outside blinds is impossible.

The *sash-pulley* (Fig. 45) is out of sight, and often almost anything in the way of material and make is considered good enough. This particular piece of hardware, however, receives so much wear, and is capable of wearing out so much good window-cord, that, if the future is to be reckoned with, care should be taken in its selection. First of all, the wheel should be as large as possible, as the constant crimping of the sash-cord over a wheel of short radius rapidly destroys the fibre, so that after giving great annoyance for a time by becoming caught in the wheel, the cord finally breaks and lets the weight drop to the bottom of the pocket.

For plate-glass windows or wide, heavy sash, chains are generally employed. They are composed of links which follow the curve of the wheel (Fig. 46), and are not easily worn out. The groove in

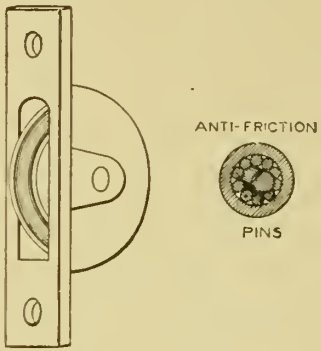



Fig. 45. Sash Pulley.

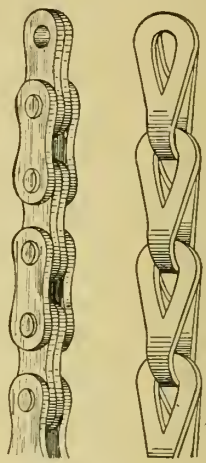


Fig. 46. Sash Chains.

the wheel should be square to conform to the lines of the chain, and not as for cord (see Fig. 47).

The pocket in which the window weight runs, should never be less than two inches in depth (crosswise), nor the pulley-style less than ⅞ of an inch thick. Thus it will be evident that to allow the weight to hang in the middle of the box, the wheel of the pulley must be not less than two inches in diameter *on its running face;* that is, the diameter of the wheel should always be equal to the thickness of the pulley-style *plus* one-half the depth of the box (see Fig. 48). The diameter here indicated is considerably larger than that of the pulley wheel used in common practice. If, however, a smaller wheel is used, not only is the cord rapidly destroyed by the constant crimping, but the weight "drags" on the back of the pulley-style, making the operation of the sash difficult and noisy.

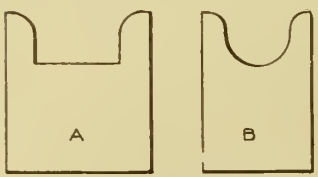



Fig. 47. Sections of Sash Pulley Rims—A. for Chain; B. for Cord.

Pulley wheels are generally measured by manufacturers and dealers, to the outside of the flanges, so that a wheel two inches on

the running face is often styled a 2½-inch wheel. The money invested in such a wheel is gained many times over in saving the annoyance and expense of broken sash-cord.

If the pulley is steel-bushed and has roller bearings, it will be better in the long run, and these items add little to the expense. The running face of the wheel should be smooth; and all parts may be of iron, without detriment to the appearance or the usefulness of the fixture. A plain brass or bronze face and wheel are to be preferred, however, if the small additional expense is not a bar.

The pulleys usually put in stock frames are 1½-inch iron pulleys costing about 50 cents a dozen; and 10 cents a dozen is usually added for each additional quarter-inch in the diameter of the wheel, though the mill man will often want a little extra for making the frame "special" in case the larger wheel is used. The brass wheel with roller bearings and brass face will cost about three times the above price—or, possibly, 50 cents extra for each window.

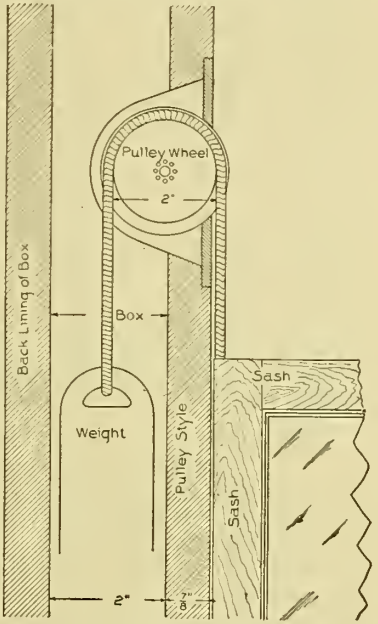



Fig. 48. Section of Pulley and Pulley-Style; Showing also Sash and Weight.

There are on the market very useful pulleys over which the sash-cord can be carried to boxes several feet away (Fig. 49). Pulleys of this type can be used where the mullions between windows are too small to carry the weights. These pulleys dispense with the necessity for lead weights, which are expensive and are usually crowded into boxes so small that they work unsatisfactorily. By the use of combinations of these pulleys, the cord can be carried an indefinite distance to a box capable of receiving a large iron weight, and

the width of the mullion can be reduced to the minimum thickness.

*Sash-cord* is a very important item, and braided cotton cord is probably the cheapest in the long run. It is better to get a *small* rather than a large size. The wearing of the cord is due to the fact that in passing over the pulley the inside or the part against the wheel is compressed or crimped, while the opposite side is stretched, thus producing a constant wear and strain of the fibre of the cord, which finally breaks it down. It will be evident that this disintegrating action will increase with the larger diameter of the cord. A cord just large enough to hold the weight safely, is the best. A simple test is to suspend four of the heaviest weights to be used, by one cord; if it will hold them, it is sufficient size to carry the one weight.

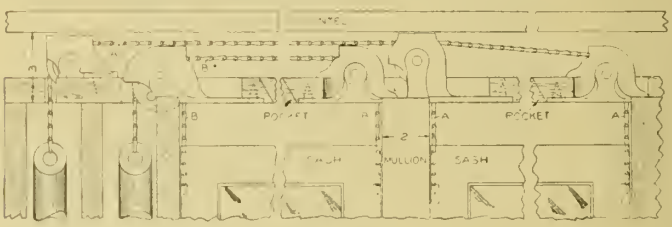



Fig. 49. Pulley Arrangement for Carrying Sash Cord to Distant Boxes.

Taken as a whole, the window—with its lock which rarely works, its exasperating pulls, and its sash-cord broken when most needed—is one of the oldest, and still one of the greatest, of modern inconveniences. Undoubtedly the first step necessary to make the window more satisfactory, it to make the sash narrower and cut the glass smaller, with substantial muntins, so that the sash will be firm. This, with a little better workmanship on the frames, will, with present appliances, make a very satisfactory window.

## MISCELLANEOUS HARDWARE

**Bolts.** The bolt is one of the oldest and simplest contrivances for securing different parts in a desired position, and is still a most necessary item of hardware. Here, weight of metal counts for as much as, if not for more than, in most other items of hardware. This weight should be balanced in the different parts to insure strength

of the whole. A heavy moving rod, for example, in some bolts, is made to engage with a thin keeper-strap attached to the base by very slight tenons headed over, so that, while it is probable that it would take 2,000 pounds pressure to break the rod, a pressure of 100 pounds might be sufficient to force the keeper-strap from its base (see Fig. 50). Inasmuch as a bolt cannot be *picked* like a lock, its value lies in its strength to resist force, and this should always be remembered in its selection.

As a general rule, all bolts operated by a sunken thumb-piece (Fig. 51) should be avoided, for, if they "stick"—and they generally do—very little power can be exerted by the end of a thumb. There are many lever and knob devices which permit the direct application of a considerable power. Two forms of these devices are shown in Figs. 52 and 53. This point should receive attention in selecting bolts for the standing leaf of a double door, or for cupboard doors.

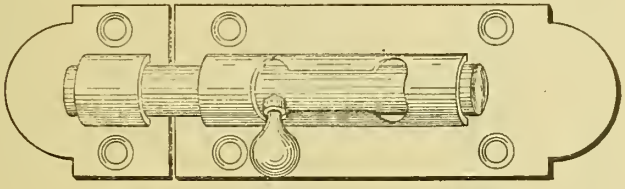


Fig. 50. Common Type of Bolt with Keeper-Strap.

The rod on a bolt should be tapered at the end, as the two parts rarely come exactly together so as to permit the rod to enter the keepers; if it tapers, it will, as it enters, draw the door to its proper position.

For *drop-front drawers* in linen closets, it is necessary, in order to save space, to use *flush hardware*—that is, hardware which does not project beyond the drawer front, which should be just inside the closet door. Fig. 54 illustrates a *flush-ring cupboard catch*, which will serve the purpose; it is of the type usually seen on store show-case doors; in fact, such doors throughout are good examples of the arrangement of drop-front drawers. A large size of fixture should always be chosen. Stay-chains should be put on each end of these fronts, to prevent them dropping below a horizontal position, in order both to prevent straining the hinge and to provide a strong extension to the drawer when open, whereon to lay linen.

In place of a bolt, to secure the standing leaf of a cupboard door, a *knee-catch* (or elbow) is often used (Fig. 55). This is more conveniently operated than a bolt, requiring no action other than shutting the door to catch, and a simple motion to open. The largest size of this fixture should always be used.

Chain bolts (Fig. 56), are most useful in allowing the door to be opened a few inches, and yet locking it with a partial security. They

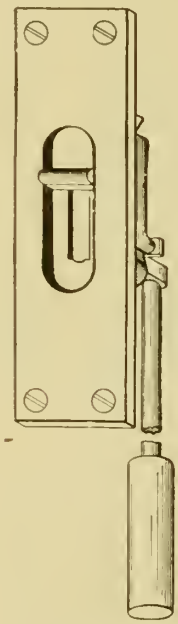


Fig. 51. Bolt with Sunken Thumb Piece.

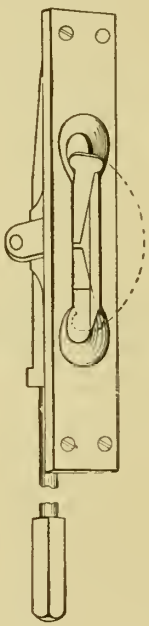


Fig. 52. Lever Bolt.

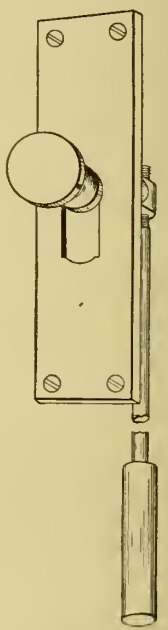


Fig. 53. Knob Bolt.

are often used to permit ventilation, or to allow the inmate to learn the character of a caller before fully opening the door.

The ice-box door of the north piazza (see Fig. 69) needs special attention, as a slight crack will allow the warm air to reach and meet the ice. A clamp which will force the door into its frame, must be used. Fig. 57 shows a good, strong form of such a clamp; ordinary strong hinges are suitable for the door.

**Door Checks and Springs.** These items are referred to under the heading *Butts*. A door check and spring consists of a very strong spring applied to close the door suddenly, and, in connection with it,

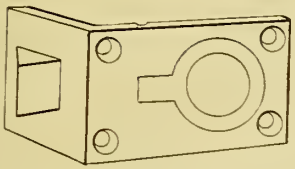


Fig. 54. Flush-Ring Cupboard Catch.

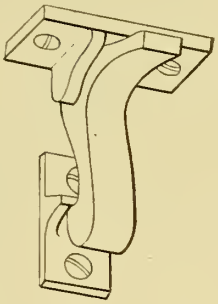


Fig. 55. Knee-Catch.

a cylinder in which a piston runs freely until the door is nearly closed, when either the air or some oil or other liquid which cannot be frozen in the cylinder checks the rapid piston action, so that the door is closed easily and without a slam (see Fig. 58). These checks cost in place from $4.00 for light doors, to $7.00 for those of heavy type. They are fastened on the top of the door, and are no disfigurement.

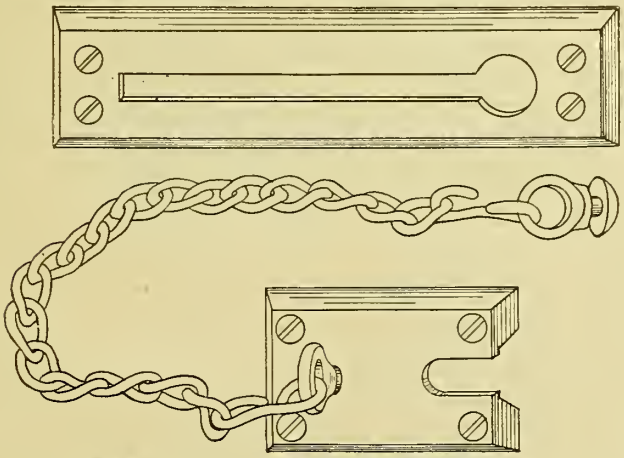


Fig. 56. Chain Bolt, Allowing Door to be Partially Opened

These springs are always in action, so that, if it is ever desired to leave the door open, some appliance must be used to accomplish

this purpose. As they do not generally permit the doors to swing back against the wall where hooks could be used, *foot-bolts* are placed on the bottom rail; these have a flat top which can be pressed by the foot into a slot in the floor.

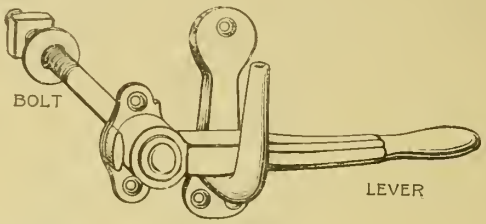



Fig. 57. Refrigerator Clamp.

There are also on the market types of patented bolts, one of which, when pushed by the foot, is forced by a strong spring against the floor: the end of the rod is protected by a heavy rubber buffer, the

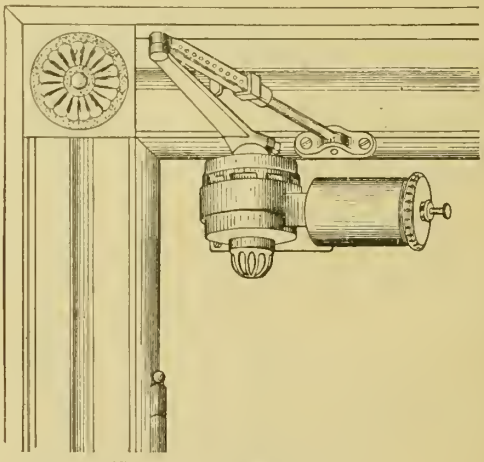


Fig. 58. Door Check and Spring.

friction of which on the floor is sufficient to hold the door in any position (Fig. 59). Fig. 60 is another convenient type of door-holder, its method of operation being self-evident.

*Kick plates* and *push plates*, while not often needed in house hardware—except, possibly, for double-acting doors—are plates of metal not less than $\frac{1}{16}$ inch thick screwed onto the face of the door to protect it from wear. The kick plate, as its name implies, is the plate put on the bottom rail where persons are likely to apply the foot in kicking the door open. In public buildings, such plates are often put on for ornament; and also, where the surrounding finish is of marble,

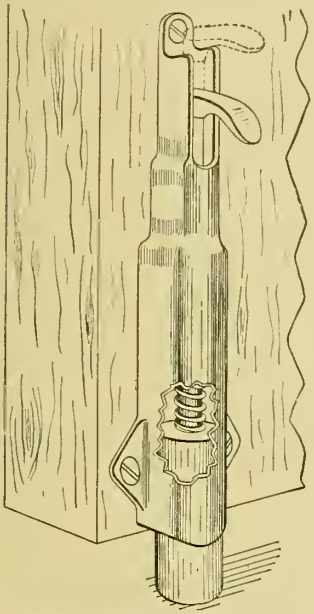


Fig. 59. Door-Holder Actuated by Spring Operated by Foot.

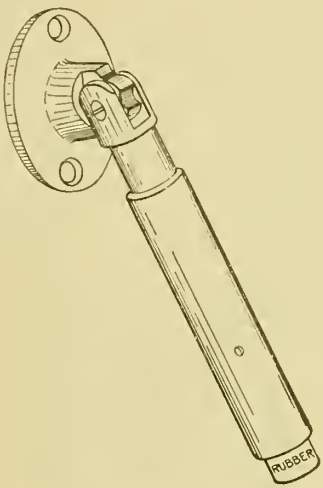



Fig. 60. Another Type of Door-Holder.

these plates protect the finish of the doors from the soap and often acid, used in cleaning the floor and base marble. It is needless to say that for such uses, the perfectly plain plate is alone appropriate.

Push plates are used to protect the finish of doors where persons push them open with the hand. If they are not used, the finish on the doors soon shows where the pressure is applied, and later it will be completely worn off.

Neither kick plates nor push plates should be used except where there is a necessity therefor; they are not properly subjects for ornamental treatment; and they add materially to the weight of the door, which in its lightest form is a severe strain on the butts. The plain face of the metal shows any indentations, and it is difficult to keep bright. Careless cleaners, moreover, are apt to rub off the finish of the wood, so that the plates become surrounded by an unsightly fringe of unfinished wood.

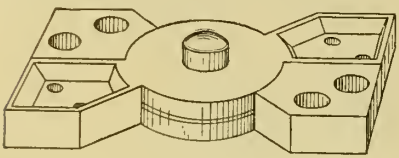


Fig. 61. Transom Fixture for Vertical Pivoting.

**Sliding-Door Sheaves.** In many places it is desirable to have the door slide back into pockets in the partitions. There are on the market many devices for trucks, generally good and inexpensive; but their installation and the framing incident thereto are matters of delicate workmanship, and if future trouble is to be avoided, it is well to see that appliances of this character are put in only by *mechanics* of known skill. After the doors are in and the partitions plastered, is a bad time to do the work over.

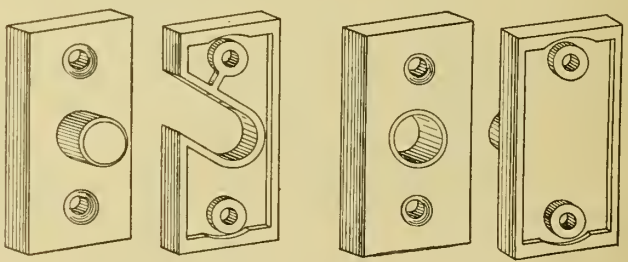


Fig. 62. Transom Fixtures for Horizontal Pivoting.

**Transom Hardware.** Transoms are generally hung from the top or bottom with fast-pin butts; or with pivots in the center of the top and bottom rail allowing them to swing at right angles with the transom bar, which is called *pivoting vertically* (Fig. 61), or with pivots in the center of each side to allow the sash to swing to a horizontal position, which is called *pivoting horizontally* (Fig. 62).

It is not necessary to refer to the butts here, except to say that

it will generally be more satisfactory to pivot the transoms than to hinge them, for, when hinged, it is necessary for the transom lifter to carry the full weight of the sash, which it very often fails to do satisfactorily; whereas, when pivoted, one side balances the other so that the lifter has nothing to do but overcome the friction of movement. These pivots are simple and easily applied.

There are on the market patented *friction pivots* of various types, which, while allowing the ordinary pivot action, hold the sash in any required position, thus doing away with the lifter. The transom, either pushed or pulled by an ordinary window pole-hook to the position desired, remains as left. To lock it in place, a large-size, heavy spring-ring catch is put in the top rail, which can be opened with the hook on the pole.

The transom lifter (Fig. 63) is an item in which little improvement has been made in the last generation. Its operation is generally unsatisfactory, and its use should be avoided if possible; but when it is necessary to use a lifter, it is advisable to get the heaviest rods, to prevent the unavoidable spring.

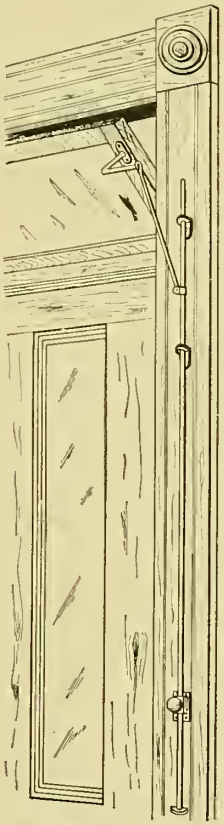


Fig. 63. Transom Lifter.

**Cellar-Window Hardware.** In this connection the hinging and locking of small cellar windows, above grade, may be considered. The sash are usually light; and it is not best to swing any portion out, as they are so near the ground that the portion turned out would be liable to damage. Also, it is often necessary to pass things through the window into the cellar, and this requires the full opening. The sash are particularly liable to shrinkage and swelling—more often the latter—which cause them to stick in the frame. Moreover, the cellar window is a favorite point for the burglar's entrance. It is

therefore usually necessary to hinge cellar windows with fast-pin butts *at the top*, to swing inward and up against the joists, and to have a strong handle for pulling them out of the frame when they stick, and a simple lock. Fig. 64 shows a simple but efficient device for fastening a cellar window. The screws in the part on the frame should be the longest obtainable; and the rivet or bolt holding the swinging part to the plate should be strongly secured, so that both points will resist any ordinary pressure from the outside. If a burglar brings his "jimmy," it is not likely that any appliance that can be used on the inside will resist its pry. For holding the window open, a strong wire hook and eye will be sufficient.

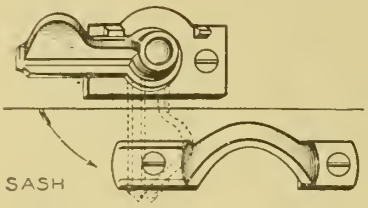



Fig. 64. Cellar-Window Fastener.

**Wardrobe Hooks.** In the selection and arrangement of wardrobe hooks, careful study will greatly increase the capacity of the usual *hanging space*. It is a mistake to select one type of hooks, and use that throughout; and also to consider that hanging space is confined to the walls. For ordinary items, common strong wire hooks (Fig. 65) can be used, set closely together; and if there is depth to the closet *flies* can be hinged so as almost to double the hanging capacity. In Fig. 66, *A A* represent the flies hinged on the wall. Arrangements of this kind, however, are not suitable for the hanging of garments which are required to retain certain shapes. For these articles, long horizontal hooks or pins (Fig. 67) should be provided; on these, certain garments can be hung close to the wall; while such items as coats can be placed on two, one in each arm, so that they will retain their shape and hang clear of the pieces against the wall.

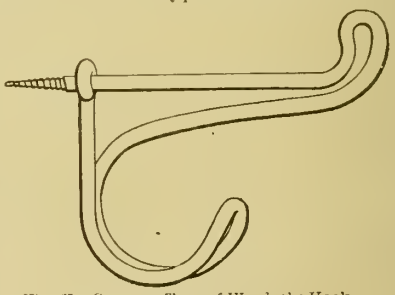


Fig. 65. Common Type of Wardrobe Hook Made from Wire.

In the more expensive materials, many special types of hooks are made for special purposes. They generally have a lower, minor hook, while the upper arm extends outward and upward for hanging hats; in other cases the upper arm extends out nearly horizontally, and then dips to support a garment clear of that below. A very useful article of furniture is a *tree* or *standard* (for use in bedrooms), to which are secured a large variety of hooks adapted to the various items of the wardrobe for daily use.

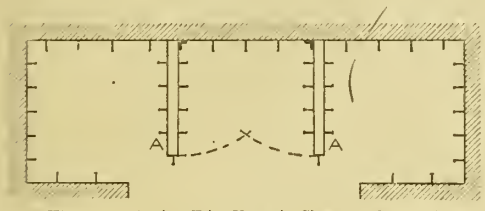


Fig. 66. Swinging Flies Hung in Closet to Economize Hanging Space.

## FINISHES OF HARDWARE

It is necessary that hardware should have some special finish; and, as in the case of wood or marble or any other fine material, the object of the better finishes is to bring out and intensify the qualities of the material itself. Cheap hardware is generally japanned so as to present a smooth, shiny black surface; this is an excellent coat for wear and for protection against rust, and is not of objectionable appearance. Where ordinary unfinished hardware is used, it should be painted, varnished, or oiled at the same time the wood to which it is secured is finished. It is also well to paint the surface which presses against the wood; if this precaution is not taken, moisture may get behind, and resulting rust discolor the wood below.

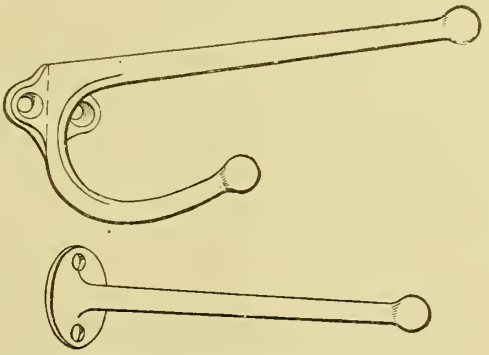


Fig. 67. Long Wardrobe Pins and Hooks.

**Wrought Finish.** Wrought iron, forged, is not often used except for specially designed work. When it is used, it should be finished under the hammer; that is, all the marks of the blows should be left, and no attempt made to file or smooth up the parts. The surface can be coated later with lacquer or some thin iron paint which will not obliterate the texture, in order to prevent rust; but under no circumstances should a coating in the nature of heavy lead and oil paint be used.

**Cast Bronze and Cast Brass.** These materials (the former being from 85 to 92 per cent copper, the balance tin and zinc; the latter from 60 to 70 per cent copper, the balance zinc and lead) are the most common finishes used in good hardware. They are sold at comparatively low prices, the finish being generally in the polished natural color, protected by a colorless lacquer. There are, however, many variations from this practice—such as strong greens—the results being produced by the action of chemicals artificially applied after all mechanical work is done. Some of these effects are very striking, but not suitable unless the surroundings are such as to call for such peculiar treatment.

**Bower-Barff Process.** This is perhaps the most successful of finishes for interior hardware. It is applied to either cast or wrought iron, and produces an intensely dense and deep black color free from gloss, over which no protective coating is needed. It, however, is expensive—equal in cost to solid cast bronze; and moreover, it is not so tough as brass or bronze, the process tending to make the metal brittle. This finish is not suitable for outdoor work in damp climates, where rust is apt sooner or later to attack it in such a way as to disintegrate the surface. While constant protection with lacquers might prevent or check this action, it is better practice, in exterior work, to use a finish adapted thereto.

**Plating.** As previously stated, this form of finish is used extensively in connection with butts, to make them correspond with the genuine brass or bronze used in knobs, etc., where plating would soon be worn off. For such purpose it is appropriate and enduring; but for exterior work, plating should not be used. Silver and gold plating are employed to a limited extent, but on account of the expense they are little used except in specially designed work.

## SELECTING AND BUYING HARDWARE

There is no part of the building process in which the necessity for absolute *system* is greater than in selecting and making out a bill of Hardware. To illustrate this point, let us take the example of the Colonial House of which detailed plans are given in the section on "Estimating" in Volume II. It is surprising to find that there are required approximately 50 types, exclusive of nails, screws, butts, etc.; and that there are 1,100 pieces of these various types required in this one building. Hardware is expensive *to buy*, and expensive to *put on*. If these eleven hundred pieces get mixed, a large amount of valuable time is consumed in getting them arranged; if too much is bought, the excess is a loss, as it is difficult to return broken lots; if not enough is purchased, the loss of time in going over the work again and again to find what is missing, is expensive; and waiting to have delivered the last belated portions of material still lacking, is exasperating.

Therefore the first thought should be to place the whole matter in such orderly shape that every point in connection with the selection, arrangement, and distribution is settled, and so clearly noted that future uncertainty relative to any point will be impossible. It is also necessary to determine the exact cost of the entire bill before deciding on any of the types; and only with a complete list is it possible to find just the relationship between the cheaper and better lines.

For all these reasons, a most useful purpose will be served if we now proceed to set forth in detail, step by step, a scheme for preparing bills of hardware, so arranging the items that definite and intelligent decision can be made, and serving also as a guide to the expeditious and accurate arrangement and distribution of the materials to the proper points for installation.

It is evident that the types at each point must be practically the same for all grades. Thus, for instance, a door requires butts (4 x 4 or 5 x 5 inches) irrespective of whether they are wrought-iron, japanned, bronze-plated, or solid cast bronze. Two knobs are required whether "Mineral" jet, wood, glass, or bronze is used. Therefore, in proceeding, the question of *quality* of material will generally be disregarded, except in cases such as knobs, where it is desirable to use a better material for the selected type in the major rooms and a cheaper material in the minor.

After the list is completed, it can be made out in three forms—the first designating the *cheapest* line appropriate; the second designating a line of *intermediate grade;* the third, the *best grade* which is suitable.

In preparing these three lines, there are many appliances which will not be varied. In the case of locks, for example, a thoroughly good grade should be used in the cheap line; there is no advantage to be gained in selecting expensive locks of the more intricate mechanism and more elaborate design, even for the better-grade schemes.

After these bills have been prepared, figures can be readily obtained on each, so that an intelligent decision based thereon can be made.

**Listing the Items.** The first step is to lay out the floor-plans, showing every point at which hardware is required (Figs. 68–71). Doors should be indicated with their swing *right-hand* (*R. H.*) or *left-hand* (*L. H.*). In the case of windows, it can generally be taken for granted that small cellar windows, unless otherwise indicated, are hinged at the top to swing up against the first-floor joists, and that all other windows, unless otherwise indicated, are *double-hung* with cord and weights. The location of china closets, pantries, linen rooms, etc., in which are cupboards, drawers, hooks, etc., should be clearly shown. These plans should be very simple, carrying no details except those necessary to indicate the need for hardware at the various points. It is better to make the drawings on tracing cloth or onion skin, so that after the hardware is designated thereon, prints can be taken for the use of the workmen.

On these skeleton drawings, every point requiring hardware should be numbered. Thus,

Basement Doors should begin with 1, 2, 3, etc.
" Windows should begin with 50, 51, 52, etc.
" Closets, cupboards, etc., should begin with 90, 91, 92, etc.
First-story Doors should begin with 101, 102, 103, etc.
" " Windows should begin with 150, 151, 152, etc.
" " Closets, cupboards, etc., should begin with 190, 191, 192, etc.
Second-story Doors should begin with 201, 202, 203, etc.
" " Windows should begin with 250, 251, 252, etc.
" " Closets, cupboards, etc., should begin with 290, 291, 292, etc., etc.

In this way the floor on which any number occurs can be recognized. Breaks in the numbering should be allowed, as it will be

found, in working out the later details, that certain points have been overlooked, and numbers can then be assigned which will not necessitate any rearrangement.

It will be noticed that in the above scheme of numbering, we have subdivided our hardware into three distinct lots—namely, for *doors*, for *windows*, and *miscellaneous items*. It is well throughout

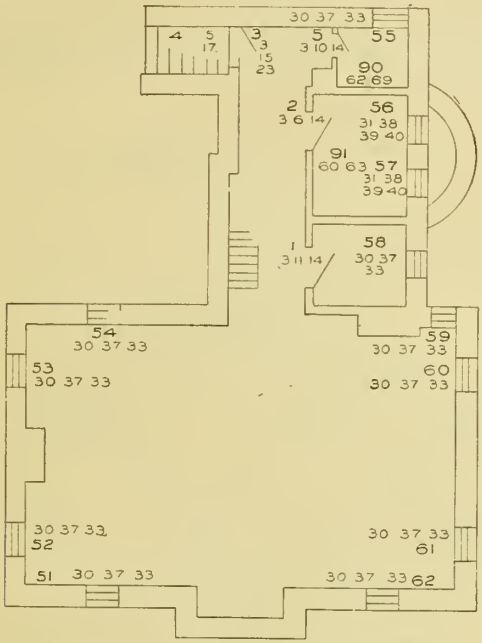



Fig. 68. Basement Plan with Hardware Items Indicated.

to keep these subdivisions entirely distinct, as in this way all liability to confusion will be practically avoided.

The second step is to make a list of appliances which will be required under the various divisions. Thus, under the heading *Doors*, we shall have

Butts of various sizes,
Locks " " kinds.
Etc. Etc.

Under the heading *Windows*, we shall have such items as

Pulleys,
Sash-locks,
Etc. Etc.

Under *Miscellaneous*, the list would include such items as

Hooks,
Drawer-pulls,
Etc. Etc.

Each item in this list should be numbered; and, to prevent confusion, designating letters should be attached, indicating the division

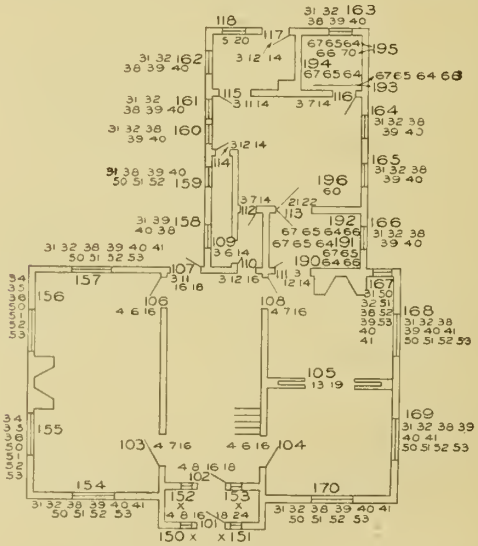



Fig. 69. First-Floor Plan, with Hardware Items Indicated.

to which it belongs. All numbers for door hardware, for example, should carry the letter *D*, as *D* 1, *D* 2, *D* 3, etc.; those for windows should carry the letter *W*, as *W* 50, *W* 51, *W* 52, etc.; and those for miscellaneous items should carry the letter *M*, as *M* 90, *M* 91, *M* 92, etc.

The third step consists in placing on the drawings, under each door, window, or miscellaneous item, the designating numbers of the hardware appliances required, so that it will be possible, by

merely referring to the plan, to ascertain just the hardware that will be required at each point. Several prints of these drawings should be made, as the successful placing of the hardware is dependent on following without deviation the lines thus laid down. The placing of a few items in wrong locations would produce confusion throughout the whole line.

The fourth step is to take three sheets of ordinary section paper ruled to quarter-inch squares each way, and to place on these sheets respectively, up and down at the left-hand edge, the layout numbers of the doors, windows, and miscellaneous items. (See Quantity

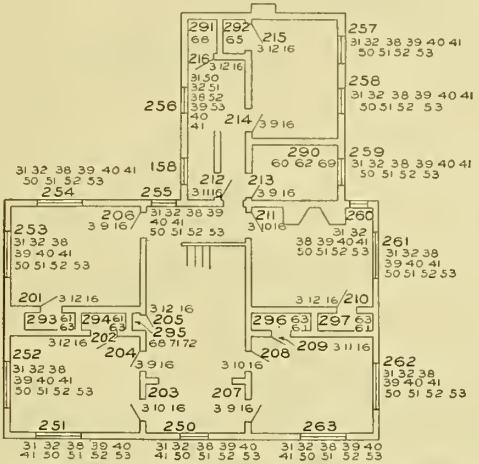



Fig. 70. Second-Floor Plan, with Hardware Items Indicated.

Sheets, pages 52-54.) Also, across the top of the sheets, place the designating numbers of the different items of hardware required under each division. Then, in the squares at the intersections of the lines running from the plan numbers and those dropping from the hardware numbers, note the quantity required.

There will be many occasions when for several doors or windows the same fixtures will be required. This condition is apt to breed carelessness, and mistakes are likely to occur for lack of *distinct consideration of each item.* If, through lack of care, three or four unnecessary appliances are included, their cost will more than offset the entire expense of making a careful bill in the first place.

As an example of how mistakes are liable to occur, note the window indicated between windows Nos. 255 and 256 in Fig. 70. This window, being on the stair, is shown in both the first and second story floors, and the hardware therefor was included in the first-story items. Unless distinct consideration is given to each item, it would be a natural mistake to double the order for this window; it would also be a natural mistake to include blind hardware for 158, 160, 161, and 162; but, by carefully examining the elevations, it is found that no blinds are required. Further, unless the detail sections through the pantry are studied, the arrangements for drawers, cupboard, flour-box are not understood.

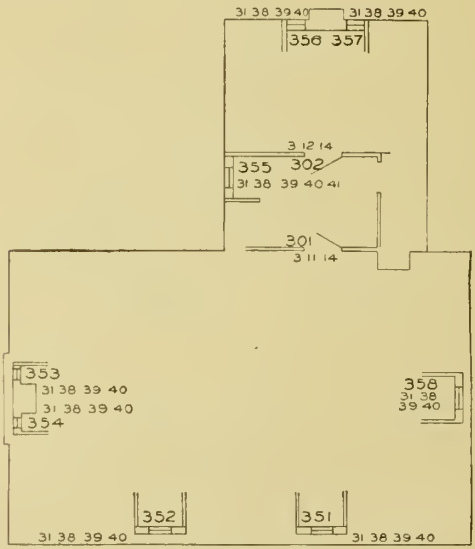



Fig. 71. Attic Plan, with Hardware Items Indicated.

The sheets are completed by adding the numbers in the vertical columns to obtain the exact number or quantity of each item required. The success of this entire scheme depends on absolute accuracy.

At this point is it very desirable that the results be *proven correct.* It is generally useless to go over the work a second or third time, following the original line, since the same mistakes are generally made each time. Some independent line, accordingly, should be selected,

in order to detect errors. A simple method is to add the number of appliances required for all points on the various plans, and then add the numbers on the sheet last prepared; if these sums agree, it is reasonably certain that no mistakes have been made.

For instance, counting the items required for doors throughout, we find we have as follows:

| | | |
|---|---|---|
| Basement | 14 | items |
| First Floor | 55 | " |
| Second Floor | 48 | " |
| Third " | 6 | " |
| Total.... | 123 | items required for doors. |

Adding up our quantity sheet, allowance has to be made when more than one of the items is used at one point. For instance three butts are required for each door, but they are noted on the plan as only one number.

We obtain the total of the items from the quantity sheet, as shown on page 52, as follows:

| | |
|---|---|
| Under *D* 3, the total 93 ÷ 3 = | 31 items. |
| " *D* 4, " " 18 ÷ 3 = | 6 " |
| Item *D* 5, is doubled at one point, so that total 3 − 1 = | 2 items |
| Items *D* 6 to *D* 21, inclusive = | 81 items. |
| *D* 22 is only one item on the plan = | 1 " |
| *D* 23 and *D* 24 = | 2 " |
| Total | 123 items. |

In case the totals do not agree, add each floor on the quantity sheet so as to locate the discrepancy on one floor. When so located, it can be quickly found.

The fifth step is to incorporate the quantities now found in a bill or list which should distinctly state the character and quality of each, and include the requirement that all necessary screws shall be provided. In doing this, the separate items may be described in detail, or referred to under their *catalogue numbers* (if catalogues are at hand). Ordinarily, however, the most economical plan is to take the list to a dealer, and find what he can furnish the cheapest to meet each requirement.

## CATALOGUES

It is entirely outside of the province of this paper to attempt to catalogue the hardware now made. There is no line of manufacture

in which the details are more intricate, and few retail or even wholesale stores carry a full line of any particular make. To persons interested in the purchase of hardware, it is suggested that upon request the manufacturers will forward catalogues showing their various lines; or such catalogues can be borrowed from a retail store. Any order for other than the commonplace, low-priced, stock hardware will generally be filled at the factory.

Any prices quoted in any textbook, can be taken only as a general guide; and it must be remembered that prices of hardware are especially liable to fluctuation. In busy times, it is often difficult to obtain a "bill of hardware" even at full market prices; whereas, when a slight easing off in business occurs, manufacturers and their agents not infrequently make material cuts in prices, in order to keep their shops full during the quiet season.

When work on any bill has reached this point, it is evident that the buyer can soon reach a decision as to whether it is necessary for him to buy a lower grade of hardware than he first intended, or whether he can afford a better.

Under the more common, slipshod way of buying hardware a man selects a few of the more prominent items without reckoning the cost of the numerous unlisted class, and is generally disappointed at the conclusion in two ways—first, in finding the number of items, and their expense, about double his first idea; and second, in finding that he has bought a lot of appliances not suited to his wants, costing as much as the items which were desired, but which his lack of forethought and system prevented him from getting.

Following the lines above laid down, our layout plans will appear somewhat as illustrated in Figs. 68 to 71; and our memoranda will have assumed a form something like the following:

**Hardware for Doors**

*D*3 Loose-pin japanned iron butts, with tip, 4 in. x 4 in
*D*4 " " " " " " " 5 in. x 5 in.
*D*5 Plain tee-hinges, 14 in.
*D*6 Knob-latches, *R. H.*
*D*7 " " *L. H.*
*D*8 " " stopwork and pass key, *R. H.*
*D*9 " " thumb-bolt.....*R. H.*
*D*10 " " " " .....*L. H.*

*D*11 Knob-latches, dead bolt .....*R. H.*
*D*12 " " " " .....*L. H.*
*D*13 Sliding-door latch.
*D*14 Mineral knobs.
*D*15 Iron store-door latch, with thumb-piece.
*D*16 Jet knobs.
*D*17 Padlock and hasp.
*D*18 Chain-bolt.
*D*19 Sliding-door hanger
*D*20 Refrigerator clamp.
*D*21 Double-acting butts
*D*22 Push-plates.
*D*23 Heavy iron bolt.
*D*24 Push button for electric bell.

### Hardware for Windows

W30 Fast-pin plain iron butts, 3 in. x 3 in.
W31 Pulleys, 2 in. on running face
W32 Sash-lifts, Hook.
W33 Heavy cellar-window fastener
W34 Loose-pin butts, 5 in. x 5 in., same as *D* 4.
W35 French window latch, *L. H.*
W36 Extension bolt.
W37 Wire hook and eye.
W38 Sash lock.
W39 " cord.
W40 " weights.
W41 " sockets.
W42 " hook.
W50 Blind hinges.
W51 " hold-backs.
W52 " catches.
W53 " adjuster.

### Miscellaneous Hardware

*M*60 Towel hooks.
*M*61 Coat hooks.
*M*62 Wardrobe hooks.
*M*63 Wire closet hooks.
*M*64 Knee-catches.
*M*65 Cupboard spring catches.
*M*66 Drawer-pulls.
*M*67 Loose-pin butts, with tips, 3 in. x 3 in.
*M*68 Fast-pin " no " 2 in. x 2 in.
*M*69 Toilet-paper holder.
*M*70 Pivot for flour-box (1 pair).
*M*71 Chain to hold drop-front drawers.
*M*72 Flush-ring cupboard catch.

## Quantity Sheet, Door Hardware

| | D 1 | D 2 | D 3 | D 4 | D 5 | D 6 | D 7 | D 8 | D 9 | D 10 | D 11 | D 12 | D 13 | D 14 | D 15 | D 16 | D 17 | D 18 | D 19 | D 20 | D 21 | D 22 | D 23 | D 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 3 | | | | | | | | 1 | | | 1 | | | | | | | | | | |
| 2 | | | 3 | | | 1 | | | | | | | | 1 | | | | | | | | | | |
| 3 | | | 3 | | | | | | | | | | | | 1 | | | | | | | | 1 | |
| 4 | | | | | 2 | | | | | | | | | | | | 1 | | | | | | | |
| 5 | | | 3 | | | | | | | 1 | | | | 1 | | | | | | | | | | |
| 101 | | | | 3 | | | | 1 | | | | | | | | 1 | | 1 | | | | | | 1 |
| 102 | | | | 3 | | | | 1 | | | | | | | | 1 | | 1 | | | | | | |
| 103 | | | | 3 | | | 1 | | | | | | | | | 1 | | | | | | | | |
| 104 | | | | 3 | | 1 | | | | | | | | | | 1 | | | | | | | | |
| 105 | | | | | | | | | | | | | 1 | | | | | | 1 | | | | | |
| 106 | | | | 3 | | 1 | | | | | | | | | | 1 | | | | | | | | |
| 107 | | | 3 | | | | | | | | 1 | | | | | 1 | | 1 | | | | | | |
| 108 | | | | 3 | | | 1 | | | | | | | | | 1 | | | | | | | | |
| 109 | | | 3 | | | 1 | | | | | | | | 1 | | | | | | | | | | |
| 110 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 111 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 112 | | | 3 | | | | 1 | | | | | | | 1 | | | | | | | | | | |
| 113 | | | | | | | | | | | | | | | | | | | | | 1 | 2 | | |
| 114 | | | 3 | | | | | | | | | 1 | | 1 | | | | | | | | | | |
| 115 | | | 3 | | | | | | | | 1 | | | 1 | | | | | | | | | | |
| 116 | | | 3 | | | | 1 | | | | | | | 1 | | | | | | | | | | |
| 117 | | | 3 | | | | | | | | | 1 | | 1 | | | | | | | | | | |
| 118 | | | | | 1 | | | | | | | | | | | | | | | 1 | | | | |
| 201 | | | 3 | | Pairs | | | | | | | 1 | | | | 1 | | | | | Pair | | | |
| 202 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 203 | | | 3 | | | | | | | 1 | | | | | | 1 | | | | | | | | |
| 204 | | | 3 | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| 205 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 206 | | | 3 | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| 207 | | | 3 | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| 208 | | | 3 | | | | | | | 1 | | | | | | 1 | | | | | | | | |
| 209 | | | 3 | | | | | | | | 1 | | | | | 1 | | | | | | | | |
| 210 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 211 | | | 3 | | | | | | | 1 | | | | | | 1 | | | | | | | | |
| 212 | | | 3 | | | | | | | | 1 | | | | | 1 | | | | | | | | |
| 213 | | | 3 | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| 214 | | | 3 | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| 215 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 216 | | | 3 | | | | | | | | | 1 | | | | 1 | | | | | | | | |
| 301 | | | 3 | | | | | | | | 1 | | | 1 | | | | | | | | | | |
| 302 | | | 3 | | | | | | | | | 1 | | 1 | | | | | | | | | | |
| | | | 93 | 18 | 3 | 4 | 4 | 2 | 5 | 4 | 6 | 11 | 1 | 11 | 1 | 25 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 1 |

## Quantity Sheet, Window Hardware

| | W 30 | W 31 | W 32 | W 33 | W 34 | W 35 | W 36 | W 37 | W 38 | W 39 | W 40 | W 41 | W 42 | | | W 50 | W 51 | W 52 | W 53 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | 1 | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 52 | 1 | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 53 | 1 | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 54 | 1 | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 55 | 1 | .. | .. | 1 | Same as D 4 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 56 | .. | 4 | .. | .. | | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 57 | .. | 4 | .. | .. | | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 58 | 1 | .. | .. | 1 | | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 59 | 1 | .. | .. | 1 | | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 60 | 1 | .. | .. | 1 | | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 61 | 1 | .. | .. | 1 | | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 62 | 1 | .. | .. | 1 | | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 150 | .. | .. | .. | No Hardware | | .. | .. | .. | .. | Feet | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 151 | .. | .. | .. | No Hardware | | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 152 | .. | .. | .. | No Hardware | | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 153 | .. | .. | .. | No Hardware | | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 154 | Pairs 4 | 2 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | .. | .. | .. | 3 | 2 | 2 | 1 |
| 155 | .. | .. | .. | .. | 6 | 1 | 2 | .. | .. | .. | .. | .. | .. | .. | .. | 3 | 2 | 2 | 1 |
| 156 | .. | .. | .. | .. | 6 | 1 | 2 | .. | .. | .. | .. | .. | .. | .. | .. | 3 | 2 | 2 | 1 |
| 157 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | .. | .. | .. | 3 | 2 | 2 | 1 |
| 158 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 159 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | 3 | 2 | 2 | .. |
| 160 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 161 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 162 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 163 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 164 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 165 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 166 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. |
| 167 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | 4 for general use | .. | .. | 3 | 2 | 2 | 1 |
| 168 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 169 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 170 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 250 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 251 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 252 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 253 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 254 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 255 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 256 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 257 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 258 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 259 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 260 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 261 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 262 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 263 | .. | 4 | 2 | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | 3 | 2 | 2 | 1 |
| 351 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| 352 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| 353 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| 354 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| 355 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | 1 | | .. | .. | .. | .. | .. | .. |
| 356 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| 357 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| 358 | .. | 4 | .. | .. | .. | .. | .. | .. | 1 | 15 | 4 | .. | | .. | .. | .. | .. | .. | .. |
| | 10 | 156 | 54 | 10 | 12 | 2 | 4 | 10 | 39 | 585 | 156 | 21 | 4 | .. | .. | 69 | 46 | 46 | 22 |

**Quantity Sheet, Miscellaneous Hardware**

| | *M*60 | *M*61 | *M*62 | *M*63 | *M*64 | *M*65 | *M*66 | *M*67 | *M*68 | *M*69 | *M*70 | *M*71 | *M*72 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | | | 4 | | | | | | | 1 | | | |
| 91 | 3 | | | 12 | | | | | | | | | |
| 190 | | | | | 1 | 1 | 3 | 2 | | | | | |
| 191 | | | | | 1 | 1 | | 2 | | | | | |
| 192 | | | | | 1 | 1 | 3 | 2 | | | | | |
| 193 | | | | | 1 | 1 | 3 | 2 | | | | | |
| 194 | | | | | 2 | 2 | | 4 | | | | | |
| 195 | | | | | 1 | 1 | 4 | 2 | | | 1 | | |
| 290 | 4 | | 6 | | | | | | | 1 | | | |
| 291 | | | | | | | 3 | | Pairs | | Pair | | |
| 292 | | | | 24 | | | | | | | | | |
| 293 | | 2 | | 30 | | | | Pairs | | | | | |
| 294 | | 2 | | 30 | | | | | | | | | |
| 295 | | | | | | | | | 3 | | | 9:0 | 3 |
| 296 | | 2 | | 30 | | | | | | | | | |
| 297 | | 2 | | 30 | | | | | | | | | |
| | 7 | 8 | 10 | 156 | 7 | 7 | 16 | 14 | 3 | 2 | 1 | 9:0 | 3 |

Based on the foregoing memoranda and quantity sheets, we are now prepared to make out a list covering every detail of hardware required, and to submit same for quotation of prices. This list, with prices quoted as current in September, 1907, for *cheap*, *medium*, and *best* grades of hardware will assume substantially the form of one of the following bills:

**BILL No. 1**

**Bill for the Cheapest Grade of Hardware which under any Conditions would be Suitable**

DOORS

| | | | | PRICE |
|---|---|---|---|---|
| *D*3 | 93, 4x4 in. wrought-iron japanned loose-pin butts, 5 knuckles, with tips on pins; 47 pairs | @ | $0.18 | $ 8.46 |
| *D*4 | 18, 5x5 in. butts, same as above; 9 pairs | @ | .30 | 2.70 |
| *D*5 | 3 Pairs 14 in. plain tee-hinges | @ | .20 | .60 |
| *D*6 | 4 R. H. plain knob latches, brass front, and strike-plate, all interior works of brass or bronze | @ | .80 | 3.20 |
| *D*7 | 4 L. H. latches same as above | @ | .80 | 3.20 |
| *D*8 | 2 R. H. cylinder latches with flat pass key and stop-work (works same as above) | @ | 4.00 | 8.00 |
| *D*9 | 5 R. H. latches with thumb-bolt (works same as above) | @ | 1.00 | 5.00 |
| *D*10 | 4 L. H. latches with thumb-bolt (works same as above) | @ | 1.00 | 4.00 |

| | | | | |
|---|---|---|---|---|
| *D*11 | 6 | R. H. latches, dead-bolt, with three tumblers and bit key (works same as above) | @ 1.00 | 6.00 |
| *D*12 | 11 | L. H. latches, dead-bolt, with three tumblers and bit key (works same as above) | @ 1.00 | 11.00 |
| *D*13 | 1 | Sliding-door latch, all brass or bronze except case | .... | 2.15 |
| *D*14 | 11 | Mineral door-knobs, round, iron escutcheons, common spindles | @ .10 | 1.10 |
| *D*15 | 1 | Heavy japanned iron store-door latch with thumb-piece | .... | .20 |
| D16 | 25 | Pairs jet knobs, with 23 pairs plain bronze-plated escutcheons approximately 1½x5½ in. @ 34c | 7.82 | |
| | | and 2 pairs solid bronze similar escutcheons, 1 pair for front vestibule door, and 1 only for outside of 2nd vestibule door and back hall door @ 81c | 1.62 | 9.44 |
| *D*17 | 1 | 2½-in. Padlock and hasp, all iron except interior of padlock, which is to be of brass and to have three tumblers; also chain for securing padlock when not in use | .... | .40 |
| *D*18 | 3 | Chain-bolts, plain wrought iron, bronze-plated | @ .60 | 1.80 |
| *D*19 | 1 | Set sliding-door hanger and track, with 5-in. iron anti-friction wheels | .... | 4.00 |
| *D*20 | 1 | Refrigerator clamp, cast-iron galvanized, 6-in. lever handle with 6-in. bolt | .... | .40 |
| *D*21 | 1 | Pair 6-in. japanned iron double-acting spring butts | .... | 1.75 |
| *D*22 | 2 | Push-plates approximately 3x12 in., wrought-iron, bronze-plated | @ .40 | .80 |
| *D*23 | 1 | Heavy iron 6-in. bolt | .... | .15 |
| *D*24 | 1 | Solid bronze, plain electric bell push-button | .... | .20 |
| | | | Total cost for doors | $ 74.55 |

## WINDOWS

| | | | | |
|---|---|---|---|---|
| W30 | 10 | Pairs 3x3 in. fast-pin plain iron butts | @ $0.06½ | $ .65 |
| W31 | 156 | Window pulleys, wheel 2-in. on running face, steel pin and bushing, wheel and face iron, 13 doz | @ 1.00 | 13.00 |
| W32 | 54 | Hook-pattern sash-lifts at least 1⅜x1¾ in. bronze-plated iron, 4½ doz | @ .28 | 1.26 |
| W33 | 10 | Heavy cellar-window fasteners, combined with pull, japanned iron | @ .08 | .80 |
| W34 | 6 | Pairs 5x5 in. loose-pin butts (same as *D* 4) | @ .30 | 1.80 |
| W35 | 2 | L. H. French window latches with lever handle (similar throughout to No. 7, except that in depth they are to be no more than 1½ in) | @ .60 | 1.20 |
| W36 | 4 | Flush bolts with knob or lever operating device, 12 in. long, bolt ⅜ in. in diameter, all visible parts iron, bronze-plated | @ 40 | 1.60 |

| | | | | | |
|---|---|---|---|---|---|
| W37 | 10 | Wire hooks and eyes, 4 in. long, wire not less than $\frac{1}{8}$ in. in diameter (No. 11 gauge) | @ | .02 | .20 |
| W38 | 39 | Sash-locks, approximately 2½x2¼ in., iron, japanned, with horizontal action and of such design that sash will be drawn ¼ in., 3¼ doz | @ | 1.00 | 3.25 |
| W39 | 600 | feet ¼ in. braided (white) cotton sash-cord, 13 lbs. | @ | .30 | 3.90 |
| W40 | 156 | Sash-weights (iron), approximately 1,800 lbs | @ | .01¾* | 31.50 |
| W41 | 21 | Flush sash-sockets, 1 in. diameter, iron, 1¾ doz | @ | .25 | .44 |
| W42 | 4 | Pull-down hooks, bronzed iron, mounted on poles 5 feet long | @ | .40 | 1.60 |
| W50 | 69 | Pairs wrought-iron blind hinges | @ | .09 | 6.21 |
| W51 | 46 | Wrought-iron blind fasteners, 3⅜ doz | @ | .50 | 1.92 |
| W52 | 46 | Iron blind catches for sill, 3⅝ doz | @ | .12 | .46 |
| W53 | 22 | Sets blind adjusters,** rods not less than $\frac{5}{16}$ in. in diameter, which will hold the blind open at any angle up to 60° from the house, 1⅝ doz | 3.50 | | 6.42 |
| | | | Total cost for windows | | $ 76.21 |

## MISCELLANEOUS HARDWARE

| | | | | | |
|---|---|---|---|---|---|
| M60 | 7 | Towel hooks, japanned iron, projection 6 in. | @ $0.15 | | $ 1.05 |
| M61 | 8 | Coat " " " " 6 in. | @ .15 | | 1.20 |
| M62 | 10 | Wardrobe " " " " 3½ in. | @ .03 | | .30 |
| M63 | 156 | Wire closet hooks, $1\frac{1}{12}$ gross | @ .90 | | .98 |
| M64 | 7 | Knee-catches, iron, japanned, plate on door approximately 1x2 in | @ .06½ | | .44 |
| M65 | 7 | Cupboard spring catches round or T-handles, base not less than 2x2 in., japanned iron | @ .25 | | 1.75 |
| M66 | 16 | Plain iron drawer-pulls, japanned, not less than 4 in. long, *one* to be used on each drawer, also one on flour-box, 1⅓ doz | @ .40 | | .54 |
| M67 | 14 | Pairs 3x3 in. loose-pin butts with tips, japanned iron, 2 to each cupboard door | @ .08 | | 1.12 |
| M68 | 3 | Pairs 2x2 in. fast-pin butts, iron (drop-front drawers) | @ .05 | | .15 |
| M69 | 2 | Toilet-paper holders, nickel-plated, to hold rolled paper, and of heavy plain pattern | @ .30 | | .60 |
| M70 | 1 | Pair heavy iron pivots for flour-box | @ .15 | | .15 |
| M71 | 9 | feet of light brass chain, for holding in horizontal position drop fronts of drawers | @ .01½ | | .14 |
| M72 | 3 | Flush-ring cupboard catches for closing drop fronts to drawers | @ .30 | | .90 |
| | | | Total cost for Miscellaneous Items | | $9.32 |

* NOTE.—The price of sash-weights varies materially in different localities, depending on local facilities for casting them.

** NOTE.—If of a type combining sill catch for securing blinds when shut, *W52* can be dispensed with; but under any circumstances *W51* will be required.

**Summary**

| | |
|---|---|
| Hardware for Doors | $ 74.55 |
| " " Windows | 76.21 |
| " " Miscellaneous Items | 9.32 |
| Total cost for cheapest grade of hardware suitable | $160.08 |

The hardware items listed in the above bill are all of a substantial character, but of such grade that at no point is money expended for the sake of appearances. The total cost, $160.08, is certainly a very low amount to expend for hardware in a home of this character. In several points, accordingly, changes from the above list can be made with advantage, as follows:

**BILL No. 2**

**Hardware of Middle Grade in Every Respect Suitable**

DOORS

| | | | | |
|---|---|---|---|---|
| *D3* | All butts for second story changed to a good quality bronze-plated butts, making these items: | | | |
| | 35 Pairs, unchanged | @ | $0.18 | $ 6.30 |
| | 12 Pairs, changed | @ | .43 | 5.16 |
| *D4* | 9 Pairs, changed to finish as above | @ | .57 | 5.13 |
| *D5*, *D6*, *D7*, *D8*, *D9*, *D10*, *D11*, *D12*, *D13*, *D14*, *D15*, price unchanged | | | | 44.45 |
| *D16* | 23 Pairs of jet knobs changed to spun or wrought metal, escutcheons not changed but with *screwless spindles* | @ | .86 | 19.78 |
| | 2 Pairs changed to cast bronze knobs to go with bronze escutcheons (outside doors) | @ | 1.50 | 3.00 |
| *D17*, *D18*, *D19*, *D20*, *D21*, unchanged | | | | 8.35 |
| *D22* | Bronze push-plates in lieu of bronzed iron (for wearing qualities only), 2 | @ | .60 | 1.20 |
| *D23* | Unchanged | | | .15 |
| *D24* | One solid bronze electric bell push-button with face-plate 2 in. x 4 in. | | | .50 |
| | Total cost for Doors | | | $ 94.02 |

WINDOWS

| | | | | |
|---|---|---|---|---|
| *W30*, *W31*, *W32*, *W33*, unchanged | | | | $ 15.71 |
| *W34* | Changed same as *D4*, 6 prs. | @ | $0.57 | 3.42 |
| *W35* | Unchanged | | | 1.20 |
| *W36* | Flush-bolts changed to bronze, 4 | @ | 1.35 | 5.40 |
| *W37*, *W38*, *W39*, *W40*, unchanged | | | | 38.85 |
| *W41* | 21 Sash sockets changed, 1 in. x 2 in. bronzed iron | @ | .50 doz. | .88 |
| *W42*, *W50*, *W51*, *W52*, *W53*, unchanged | | | | 16.61 |
| | Total cost for Windows | | | $ 82.07 |

MISCELLANEOUS HARDWARE

| | | | | |
|---|---|---|---|---|
| *M*60, *M*61, *M*62, *M*63, *M*64, unchanged | | | .... | $ 3.97 |
| *M*65 | 7 Cupboard spring catches, changed to bronzed iron (same price as japanned) | @ | .25 .... | 1.75 |
| *M*66 | 16 Drawer-pulls, changed to bronze-plated | @ | .60 doz. | .80 |
| *M*67 | 14 Pairs 3 in. x 3 in. loose-pin butts, changed to bronze-plated | @ | .18 .... | 2.52 |
| *M*68, *M*69, *M*70, *M*71, *M*72, unchanged | | | .... | 1.94 |
| | Total Cost for Miscellaneous Items | | | $ 10.98 |

**Summary**

| | |
|---|---|
| Hardware for Doors | $ 94.02 |
| " " Windows | 82.07 |
| " " Miscellaneous items | 10.98 |
| Total cost for hardware of middle grade in every respect suitable | $187.07 |

If it is desired to place the *best hardware* which is in any way suitable for the dwelling under consideration, a bill along the following lines would be made up (not duplicating the detail of the first or second bills where unchanged):

**BILL NO. 3**

**Hardware of Best Grade**

DOORS

| | | | | |
|---|---|---|---|---|
| *D*3 | All butts in second story changed to the best quality of bronze-plated or wrought-bronze, ball-bearing 12 pairs | @ | $0.62 .... | $ 7.44 |
| | Unchanged, 35 pairs | @ | .18 .... | 6.30 |
| *D*4 | 9 Pairs changed to finish same as above | @ | .75 .... | 6.75 |
| *D*5, *D*6, *D*7, *D*8, *D*9, *D*10, *D*11, *D*12, *D*13, *D*14, *D*15, unchanged | | | .... | 44.45 |
| *D*16 | 23 Pairs of knobs and escutcheons, changed to cast metal | @ | 1.50 .... | 34.50 |
| | 2 Pairs not changed from Bill No. 2 | | .... | 3.00 |
| *D*17, *D*18, Unchanged | | | .... | 2.20 |
| *D*19 | One set sliding-door hangers, changed to ball-bearing | | .... | 5.50 |
| *D*20 | One refrigerator clamp, changed to brass | | .... | .75 |
| *D*21 | One spring double-acting hinge unchanged | | .... | 1.75 |
| *D*22, *D*23, *D*24, unchanged from Bill No. 2 | | | .... | 1.85 |
| | Total Cost for Doors | | | $114.49 |

WINDOWS

| | | | | |
|---|---|---|---|---|
| *W*30 | Unchanged | | .... | $ 0.65 |

| | | | | |
|---|---|---|---|---|
| W31 | 156 Window pulleys, changed to bronze face and wheel, roller-bearings, 13 doz. | @ | 4.60 doz. | 59.80 |
| W32 | 54 Flush bronze sash-lifts, 3 in. x 1⅝ in. | @ | .60 doz | 2.70 |
| W33 | Same as in Bill No. 1. | | .... | .80 |
| W34 | 6 Pairs, changed to best-quality bronze-plated or wrought bronze, ball-bearing. | @ | .75.... | 4.50 |
| W35 | Unchanged. | | .... | 1.20 |
| W36 | " from Bill No. 2. | | .... | 5.40 |
| W37 | " " " " 1. | | .... | .20 |
| W38 | 39 Solid bronze sash-locks, 3¼ doz. | @ | 4.00.... | 13.00 |
| W39 | 600 Feet sash chain in lieu of cotton cord. | @ | .02½... | 13.50 |
| W40 | Unchanged from Bill No 1. | | .... | 31.50 |
| W41 | 21 Sash sockets, same as in Bill No. 2. | | .... | .88 |
| W42 | 4 Bronze pull-down hooks polished poles. | @ | 1.00.... | 4.00 |
| W50, W51, W52, W53, unchanged. | | | .... | 15.01 |
| | Total Cost for Windows. | | | $153.14 |

MISCELLANEOUS HARDWARE

| | | | |
|---|---|---|---|
| *M*60, *M*61, *M*62, *M*63, *M*64, *M*65, *M*66, *M*67, *M*68, *M*69, *M*70, *M*71, *M*72, unchanged from Bill No. 2. | | .... | $10.98 |

**Summary**

| | |
|---|---|
| Hardware for Doors | $114.49 |
| " " Windows | 153.14 |
| " " Miscellaneous Items | 10 98 |
| Total Cost for Hardware of Best Grade | $278.61 |

By comparing the figures of these three bills, it will be seen that the price varies as follows:

| | |
|---|---|
| Bill No. 1—Very plain but thoroughly substantial hardware | $160.08 |
| Bill No. 2—Varying from the above by using more ornamental fixtures | 187.07 |
| Bill No. 3—By using the best material and appliances appropriate | 278.61 |

Attention is very particularly directed to the fact that none of the bills call for designs with other than *plain surfaces*. For general use, where the best results from all points are desired, the scheme on which Bill No. 2 is based is by far the best. Few persons would ever notice a difference between schemes No. 2 and No. 3, although the latter costs nearly 50 per cent more than the former.

# EXAMINATION PAPER

# HARDWARE

**Read Carefully:** Place your name and full address at the head of the paper. Any cheap, light paper like the sample previously sent you may be used. Do not crowd your work, but arrange it neatly and legibly. *Do not copy the answers from the Instruction Paper; use your own words, so that we may be sure that you understand the subject.*

1. What is the difference between a *hinge* and a *butt?*

2. What hardware attachments are desirable when outside window blinds are used?

3. What is the difference between a *lock*, a *latch*, and a *bolt?* How is a latch sometimes made to serve the purpose of a lock? What is a *dead bolt?*

4. What is the difference between a right-hand and a left-hand door?

5. How are door knobs prevented from getting loose?

6. What is meant by *flush* hardware? Give instances of its use. Illustrate, if possible, with diagrams.

7. What are the essential features of a good type of escutcheon?

8. Write a brief historical sketch of the development of the common nail.

9. Describe the different kinds of nails now in common use, noting their relative advantages for different kinds of work and the precautions that should be taken in driving them.

10. Describe the two main classes of locks, with a diagram illustrating each.

11. If you were asked to inspect the window-sash hardware in an up-to-date modern dwelling-house, make out a list of the items you would look for.

12. In joining woodwork, what method is sometimes adopted to overcome the effects of shrinking and swelling?

13. Discuss, giving diagrams, the possibility of the artistic use of strap hinges and tee-hinges.

14. Describe the different classes of door butts, and compare their advantages.

15. Compare the use of nails and screws in finished work.

16. Draw a diagram illustrating the ordinary method of installing sash-pulleys.

17. Describe, and illustrate with diagram, a method of economizing the hanging space in a wardrobe.

18. Describe the different methods of hanging transoms.

19. If you had decided to build a house, tell how you would proceed to make an estimate of the hardware items necessary.

20. Give your ideas of the best methods of making a house burglar-proof.

**After completing the work, add and sign the following statement:**
I hereby certify that the above work is entirely my own.
(Signed)